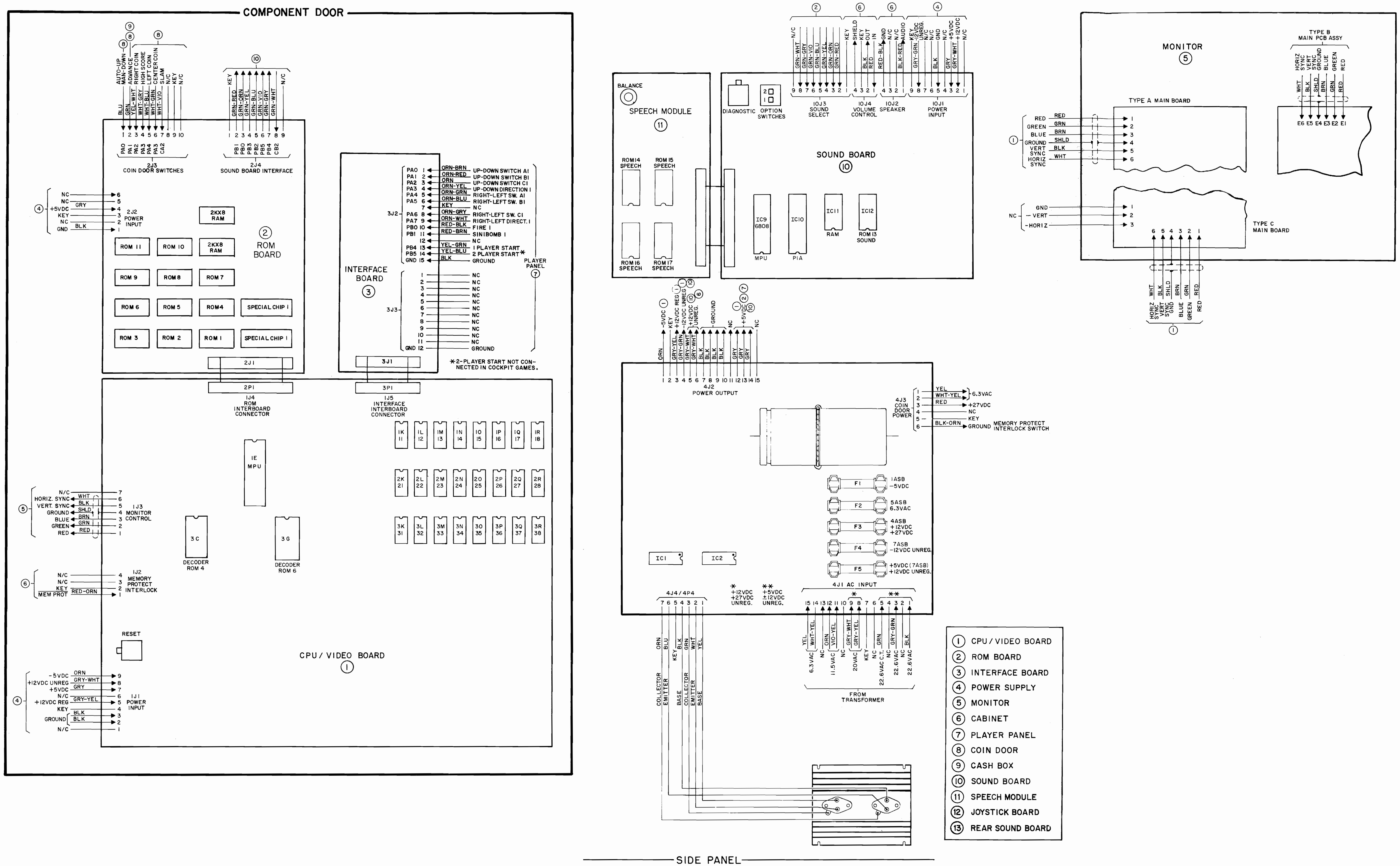
16-3004-103

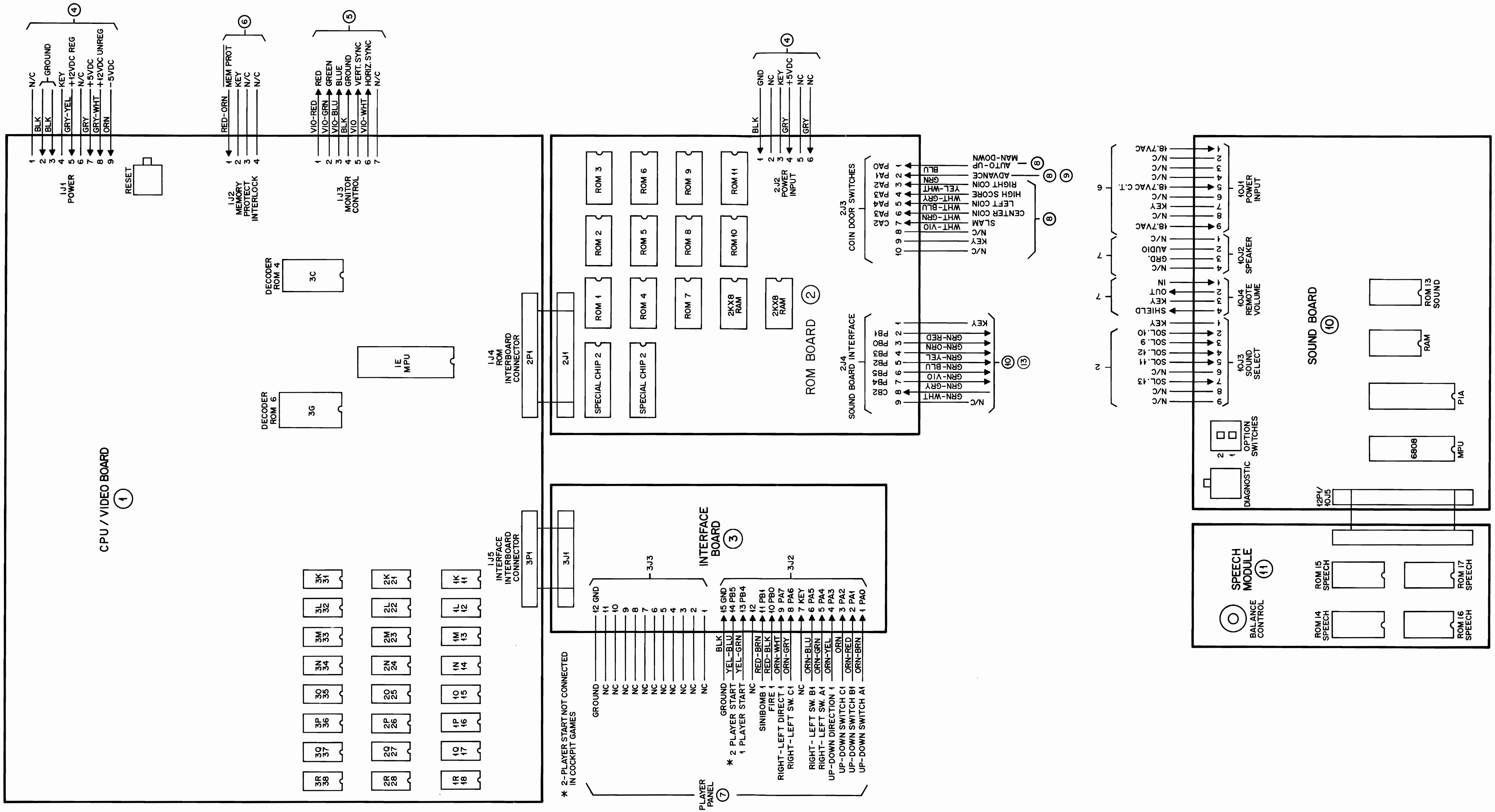
Williams® Drawing Set



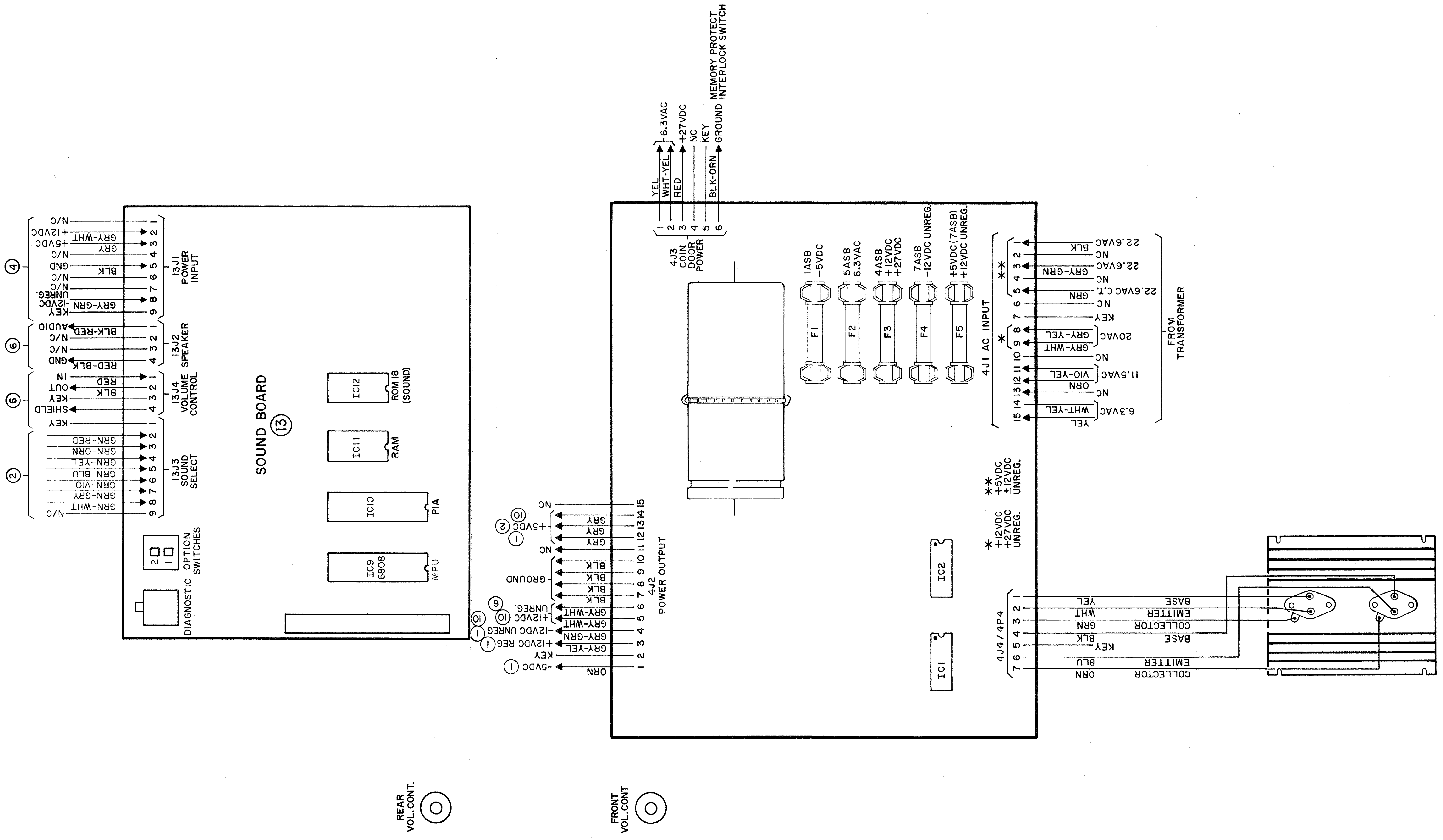
INTERBOARD WIRING



Interboard Wiring Diagram (upright)



Interboard Wiring Diagram
(cockpit front)


SOUND BOARD 13
13J1 POWER INPUT
13J2 SPEAKER
13J4 VOLUME CONTROL
13J3 SOUND SELECT
OPTION SWITCHES
DIAGNOSTIC
IC12
ROM 18 (SOUND)
IC11
RAM
IC10
PIA
IC9 6808
MPU
4J3 COIN DOOR POWER
6.3VAC
+27VDC
NC
KEY
GROUND
MEMORY PROTECT INTERLOCK SWITCH
1ASB -5VDC
5ASB 6.3VAC
4ASB +12VDC +27VDC
7ASB -12VDC UNREG.
+5VDC (7ASB) +12VDC UNREG.
F1
F2
F3
F4
F5
4J1 AC INPUT
FROM TRANSFORMER
4J2 POWER OUTPUT
IC2
IC1
4J4 / 4P4
REAR VOL.CONT.
FRONT VOL.CONT.

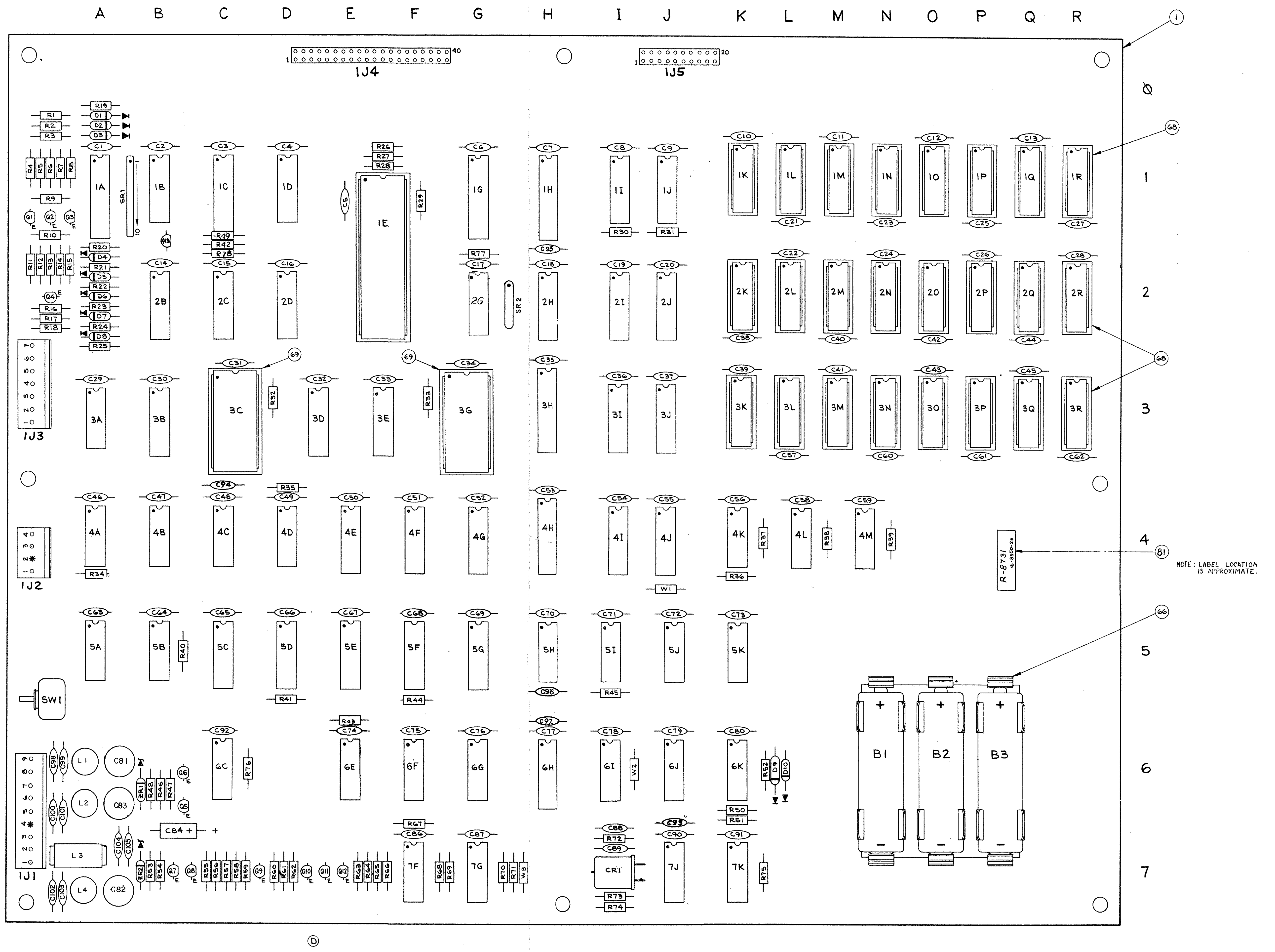
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
74	5791-09497-00	1J3	7 PIN HEADER 09-65-1071	1
75	5791-09027-00	1J1	9 PIN HEADER 09-65-1091	1
76	5019-09669-00	SR1	RESISTOR, 1 K OHM 10 PIN SIP	1
77	5010-09534-00	W1, W2, W3	RESISTOR, C.F. 0 OHM 1/4 WATT	3
78	5340-09689-00	1C	5114 1K X 4 CMOS STATIC RAM	1
	5340-09667-00		6514 1K X 4 CMOS STATIC RAM	0
79	5281-09483-00	1B, 2B	74LS189 16 X 4 RAM	0
	5280-09625-00		7489 16 X 4 RAM	0
	5282-09716-00		74S189 16 X 4 RAM	0
	5281-09715-00		74LS289 16 X 4 RAM	2
	5282-09717-00		74S289 16 X 4 RAM	0
80	5641-09371-00	SW1	PUSH BUTTON SW. SPST	0
	5641-09312-00		PUSH BUTTON SW. DPDT MOM.	1
81	16-8850-26	——	LABEL PCB ASSY I.D.	1
82				
83	5019-09786-00	SR2	SIP 4.7KΩ 5R 6 PIN 5% 125 W/R@70°C	1
84	5281-09856-00	1H, 3H, 4H	OCTAL LATCH 74LS373	3
85				
47	5010-09035-00	R64	RESISTOR, C.F. 47 K OHM 5% 1/4 W.	1
48	5551-09822-00	L3	COIL, 4.7 μH, 3A	1
49	5010-09001-00	R2, R21, R24	RESISTOR, C.F. 330 OHM 5% 1/4 W.	3
50	5010-09039-00	R56	RESISTOR, C.F. 10 OHM 5% 1/4 W.	1
51	5043-09491-00	C89, C93	CAPACITOR, AXIAL 22 PFD. 1K V. ±10%	2
52	5043-09492-00	C88,	CAPACITOR, AXIAL 100 PFD. 50 V. ±10%	1
53	5040-09545-00	C84	CAPACITOR, AXIAL 22 MFD. 10 V. ±20%	1
54	5043-09065-00	C94 THRU C97	CAPACITOR, AXIAL 470 PFD. 50 V. X7R ±20%	4
55	5043-08996-00	SEE NOTE #3	CAPACITOR, AXIAL .1 MFD. 50 V. ±20%	85
56	5040-09421-00	C81, C82, C83	CAPACITOR, RADIAL 100 MFD. 25 V. +50 -10%	3
57	5075-09059-00	ZR2	IN5990A 3.9 V. ZENER DIODE	1
58	5075-09018-00	ZR1	IN5996A 6.8 V. ZENER DIODE	1
59	5070-08919-00	D1, D2, D3, D4, D5, D6, D7, D8	IN4148 DIODE, SILICON	8
60	5070-09266-00	D9	IN5817 DIODE, SILICON	1
61	5160-08938-00	Q5, Q6, Q7, Q8, Q9 Q10, Q11, Q13	2N4401, TO-92 TRANSISTOR, NPN	8
62	5190-09016-00	Q1, Q2, Q3, Q4, Q12	2N4403, TO-92 TRANSISTOR, PNP	5
63	5520-09495-00	CR1	12 MHZ CRYSTAL	1
64	5043-09845-00	C98-C105	CAPICITOR, AXIAL 1000 PFD 50V ±20%	8
65	5880-09022-00	B1, B2, B3	BATTERY ALKALINE 1.5 V. (AA)	3
66	5881-09021-00	——	BATTERY HOLDER #171	1
67	5700-09628-00	——	14-PIN IC SOCKET	0
68	5700-09006-00	——	16-PIN IC SOCKET	24
69	5700-09004-00	——	24-PIN IC SOCKET	2
70	5700-08985-00	——	40-PIN IC SOCKET	1
71	5791-09437-00	1J5	20 PIN RIBBON CABLE HEADER	1
72	5791-09349-00	1J4	40 PIN RIBBON CABLE HEADER	1
73	5791 09028-00	1J2	4 PIN HEADER 09-65-1041	1

NOTES:

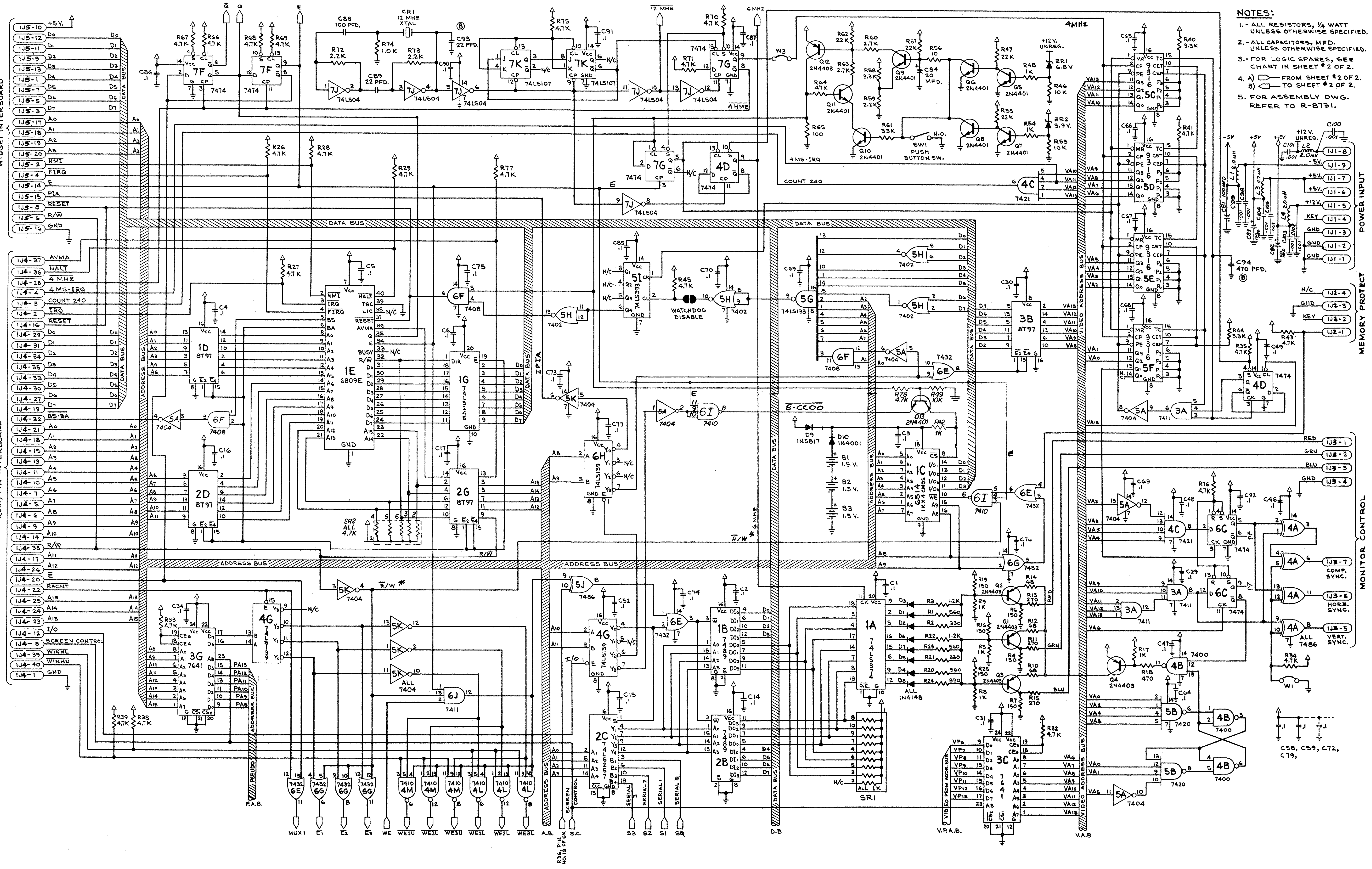
1. 4116: 1K, 1L, 1M, 1N, 1O, 1P, 1Q, 1R, 2K, 2L, 2M, 2N, 2O, 2P, 2Q, 2R, 3K, 3L, 3M, 3N, 3O, 3P, 3Q, 3R
2. 4.7K Ω RESISTOR: R26, R27, R28, R29, R32, R33, R35, R36, R37, R38, R39, R41, R43, R45, R50, R51, R52, R66 R67 R68, R69, R70, R71, R75, R34, R76, R77, R78
3. .1 MFD. CAPACITORS: C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61, C62, C63, C64, C65, C66, C67, C68, C69, C70, C71, C72, C73, C74, C75, C76, C77, C78, C79, C80, C86, C87, C90, C91, C92
4. FOR SCHEMATIC REFER TO 16-8809

BILL OF MATERIAL

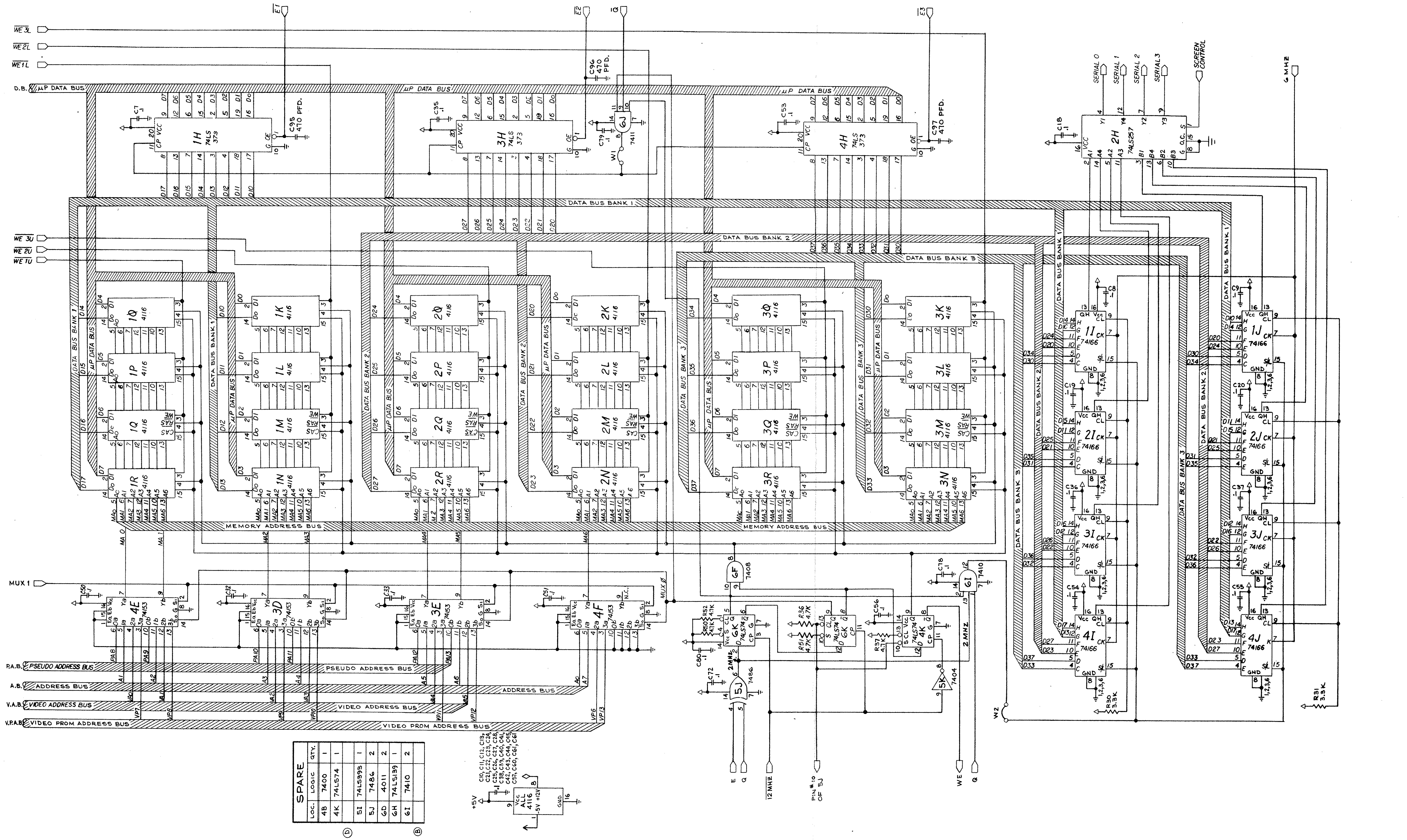
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	5770-09656-00		BARE P.C. BOARD REV. D	1
2	5280-09073-00	4B	7400 QUAD 2-INPUT NAND	1
3	5280-08948-00	5H	7402 QUAD 2-INPUT NOR	1
4	5281-09215-00	7J	74LS04 HEX. INVERTER	1
5	5280-09013-00	5A, 5K	7404 HEX. INVERTER	2
6	5280-08973-00	6F	7408 QUAD AND	1
7	5280-09011-00	4L, 4M, 6I	7410 TRIPLE 3-INPUT NAND	3
8	5280-09475-00	3A, 6J	7411 TRIPLE 3-INPUT AND	2
9	5280-09530-00	5B	7420 DUAL 4-INPUT NAND	1
10	5280-09476-00	4C	7421 DUAL 4-INPUT AND	1
11	5280-09477-00	6E, 6G	7432 QUAD 2-INPUT OR	2
12	5280-09478-00	4D, 4K, 6K 6C, 7F, 7G	7474 DUAL-D TYPE FLIP-FLOP	6
13	5280-09479-00	4A, 5J	7486 QUAD 2-INPUT EX-OR	2
14	5281-09480-00	7K	74LS107 DUAL J-K FLIP-FLOP	1
15	5281-09532-00	5G	74LS133 13-INPUT NAND	1
16	5281-09246-00	4G, 6H	74LS139 DUAL 2 to 4 LINE DECODER	2
17	5280-09481-00	3D, 3E, 4E, 4F	74153 DUAL 4 to 1 DATA INVERT	4
18	5280-09668-00	1I, 1J, 2I, 2J 3I, 3J, 4I, 4J	74166 8-BIT SHIFT REGISTER	8
19				
20	5281 09308-00	1G	74LS245 OCTAL BUS TRANSCEIVER	1
21	5281-09485-00	2C, 2H	74LS257 QUAD DATA MULPX.	2
22	5370-08989-00	1D, 2D, 2G, 3B	8T97 HEX. TS BUFFER	0
	5281-09385-00		74LS367 HEX BUS DRIVER	4
23	5281-09486-00	1A,	74LS374 OCTAL D-TYPE FLIP-FLOP	1
24	A-5342-09821	3C	UNIVERSAL VERT. DECODER ROM 6	1
25	A-5342-09694	3G	UNIVERSAL HORZ. DECODER ROM 4	1
26	5551-09848-00	L1, L2, L4	COIL, 2.0 μH, .5A	3
27	5281-09533-00	5I	74LS393 DUAL 4-BIT BIN. COUNTER	1
28	5340-09488-00	SEE NOTE #1	4116 (450 ns ACCESS) 16 K x 1 DYNAMIC RAM	24
29	5070-06258-00	D10	IN4001 DIODE	1
30	5280-09489-00	5C, 5D, 5E, 5F	9316 4-BIT BIN. COUNTER	4
31	5400-09490-00	1E	6809 E MICROPROCESSOR	1
32	5010-09548-00	R10, R12, R14	RESISTOR, C.F. 68 OHM 2% 1/4 W.	3
33	5010-09036-00	R65	RESISTOR, C.F. 100 OHM 5% 1/4 W.	1
34	5010-09187-00	R4, R6, R7, R16, R19, R25	RESISTOR, C.F. 150 OHM 5% 1/4 W.	6
35	5010-09508-00	R11, R13, R15	RESISTOR, C.F. 270 OHM 2% 1/4 W.	3
36	5010-09416-00	R18	RESISTOR, C.F. 470 OHM 5% 1/4 W.	1
37	5010-08992-00	R1, R20, R23	RESISTOR, C.F. 560 OHM 5% 1/4 W.	3
38	5010-09358-00	R42, R5, R9, R17, R48, R54, R74	RESISTOR, C.F. 1 K OHM 5% 1/4 W	8
39	5010-09314-00	R3, R22	RESISTOR, C.F. 1.2 K OHM 5% 1/4 W.	2
40	5010-08998-00	R59, R72, R73	RESISTOR, C.F. 2.2 K OHM 5% 1/4 W.	3
41	5010-08997-00	R60, R63	RESISTOR, C.F. 2.7 K OHM 5% 1/4 W.	2
42	5010-08983-00	R30, R31 R40, R44, R58	RESISTOR, C.F. 3.3 K OHM 5% 1/4 W.	5
43	5010-08991-00	SEE NOTE #2	RESISTOR, C.F. 4.7 K OHM 5% 1/4 W.	
44	5010-09034-00	R49, R46, R53	RESISTOR, C.F. 10 K OHM 5% 1/4 W.	3
45	5010-08774-00	R47, R55, R57, R62	RESISTOR, C.F. 22K OHM 5% 1/4 W.	4
46	5010-09113-00	R61	RESISTOR, C.F. 33K OHM 5% 1/4 W.	1



R-8731 CPU Board Assembly Drawing



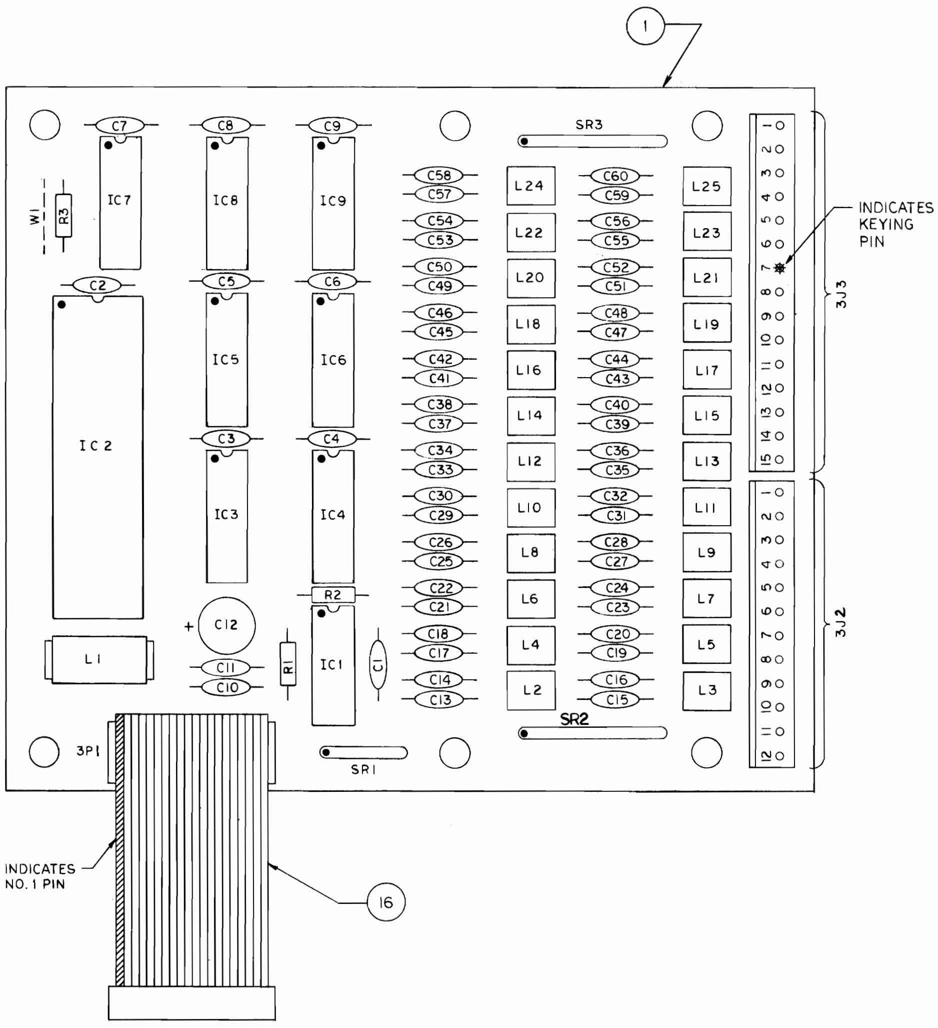
R-8731 CPU Board Logic Diagram
(Sheet 1 of 2)



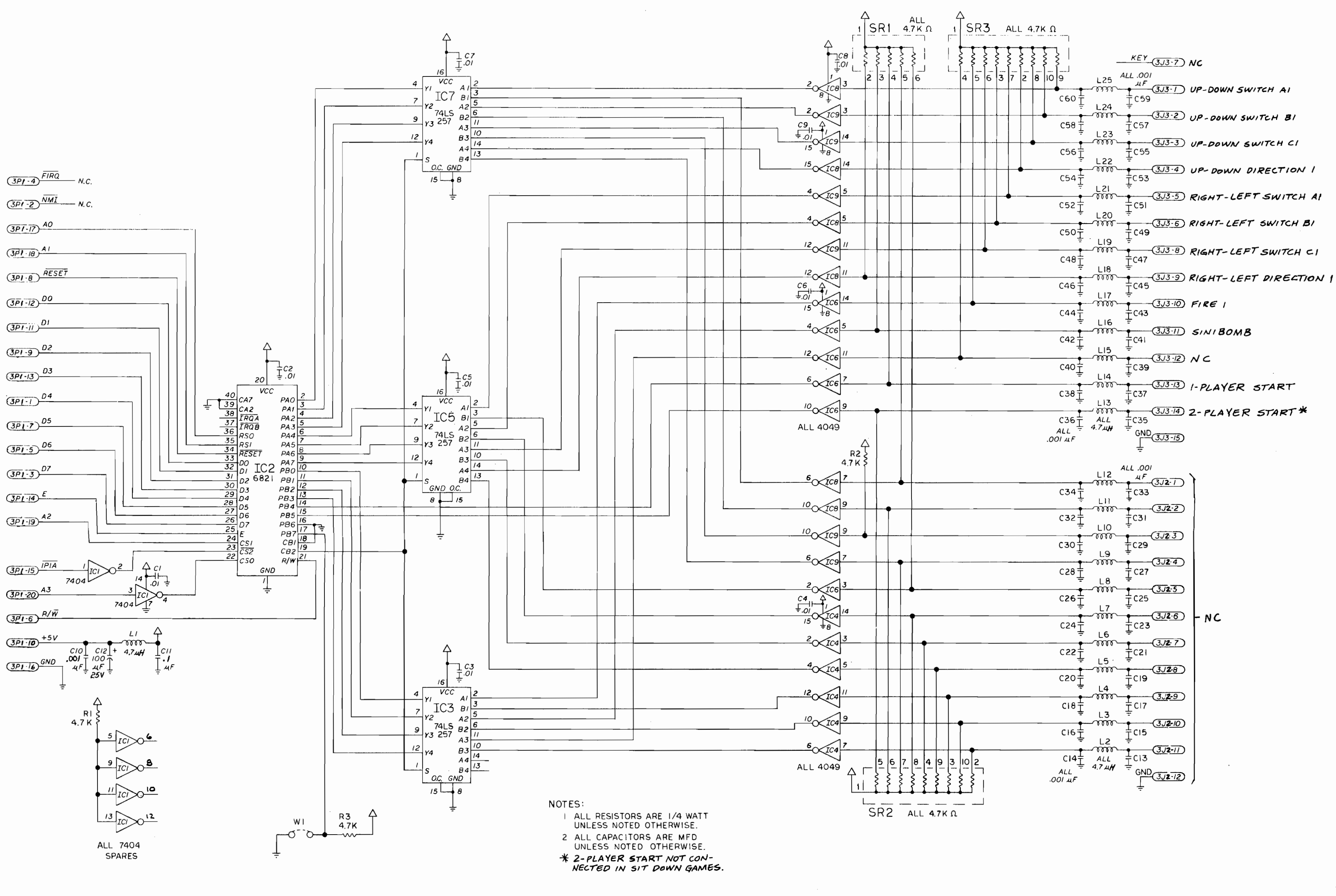
SPARE

LOC.	LOGIC	QTY.
4B	7400	1
4K	74LS74	1
5I	74LS393	1
5J	7486	2
6D	4011	2
6H	74LS139	1
6I	7410	2

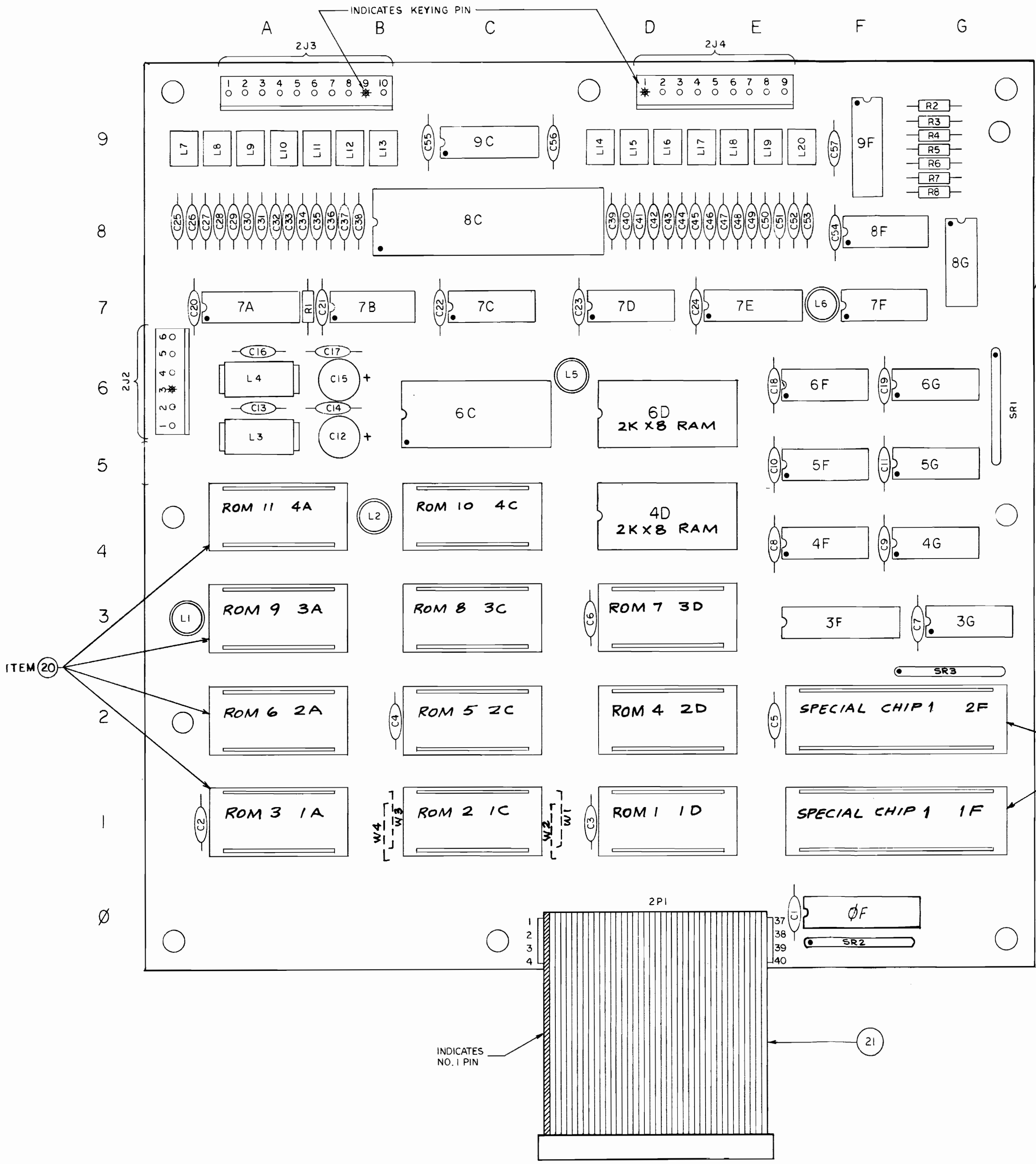
R-8731 CPU Board Logic Diagram (Sheet 2 of 2)



BILL OF MATERIAL				
ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	NO. REQ'D
1	5712-09869-00		BARE P.C. BOARD	1
2	5280-09013-00	IC1	I.C.,7404 HEX INVERTER	1
3	5430-08972-00	IC2	I.C.,MC6821 PIA	1
4	5281-09465-00	IC3,IC5,IC7	I.C., 74LS257	3
5	5310-08975-00	IC4,IC6, IC8,IC9	I.C.,4049 INV. HEX BUFFER	4
6	5010-08991-00	R1,R2,R3	RESISTOR, 4.7K Ω 1/4W 5%	3
7	5019-09786-00	SR1	SIP 4.7K Ω 5R 6-PIN 5% .125 W/R @ 70°C	1
8	5019-09362-00	SR2, SR3	SIP 4.7K Ω 9R 10-PIN 5% .125 W/R @ 70°C	2
9	5043-09845-00	C10, C13 THRU C60	CAP, AXIAL, 1000 pF, 50V	49
10	5043-08996-00	C11	CAPACITOR, AXIAL .1 µF. 50V ± 20%	1
11	5040-09421-00	C12	CAPACITOR, RADIAL 100µF 25V + 50-10%	1
12	5551-09822-00	L1	COIL, 4.7 µH 3A	1
13	5551-09825-00	L2 THRU L25	COIL, 4.7 µH 30mA	24
14	5791-09043-00	3J2	HEADER 12-PIN, 09-65-1121	1
15	5791-09074-00	3J3	HEADER 15-PIN, 09-65-1151	1
16	5795-09540-00	3P1	20 PIN RIBBON CABLE ASSY.	1
17	5043-08980-00	C1 THRU C9	CAP, AXIAL, CERAMIC, .01 MFD. 50V + 80 - 20%	9
18	5010-09534-00	W1	RESISTOR, C.F. 0Ω	0



C-8783 Interface Board Assembly and Logic Diagram



GAME NAME	SINISTAR
ASSEM NO.	D-9179-3004
1D	A-5343-10128-A/B
1C	A-5343-10129-A/B
1A	A-5343-10130-A/B
2D	A-5343-10131-A/B
2C	A-5343-10132-A/B
2A	A-5343-10133-A/B
3D	A-5343-10134-A/B
3C	A-5343-10135-A/B
3A	A-5343-10136-A/B
4C	A-5343-10137-A/B
4A	A-5343-10138-A/B

NOTE:
FOR TYPE "A" ROMS (2532) USE W-1, W-4, FOR TYPE "B" ROMS (2732) USE W-1, W-3.

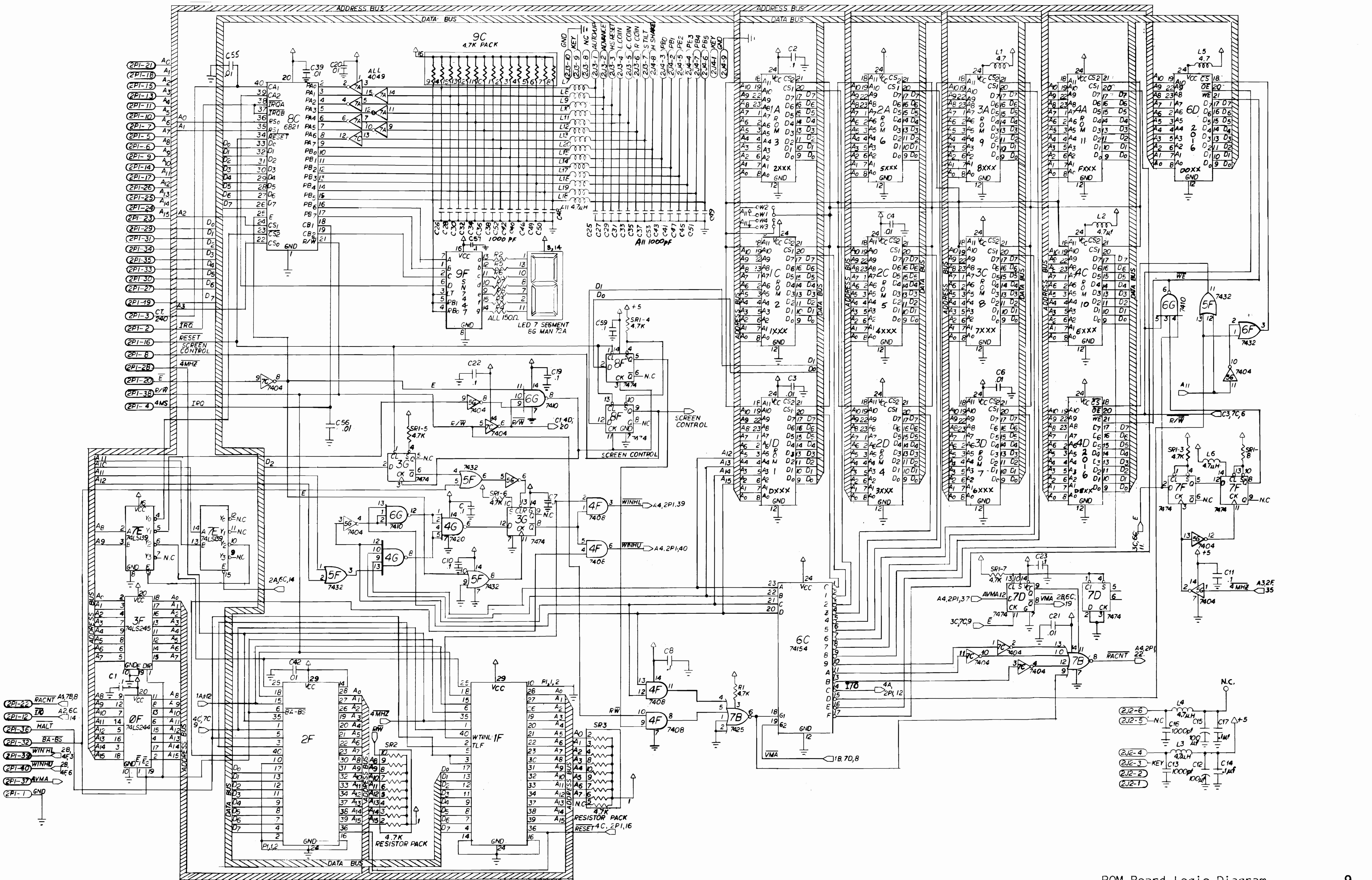
D-9176 BILL OF MATERIALS

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	NO. REQ'D
1	5771-09859-00		BARE P.C. BOARD	1
2	5280-09407-00	9F	7447BCD TO 7 SEG LED DISPLAY	1
3	5280-09478-00	3G,7D,7F,8F	7474 DUAL-D TYPE FLIP-FLOP	4
4	5281-09246-00	7E	74LS139 DUAL 2 TO 4 LINE DECODER	1
5	5280-09530-00	4G	7420 DUAL 4-INPUT NAND	1
6	5280-09011-00	6G	7410 TRIPLE 3 INPUT NAND	1
7	5280-09013-00	5G, 7C	7404 HEX INVERTERS	1
8	5280-09551-00	7B	DUAL 4 INPUT 7425 NOR GATE WITH	1
9	5280-09010-00	6C	74154 4 TO 16 LINE DEC./DEMULT	1
10	5430-08972-00	8C	MC 6821 PIA	1
11	5019-09239-00	9C	4.7K 15 RES 16 PIN DIP PACK	1
12	5010-09187-00	R2 THRU R8	RESISTOR CF 150 OHM 5% 1/4W	7
13	5280-09477-00	5F, 6F	7432, QUAD 2 INPUT OR	2
14	5010-08991-00	R1	RESISTOR CF 4.7K OHM 5% 1/4W	1
15	5671-09411-00	8G	MAN 72A 7SEG LED DISPLAY	1
16	5043-08980-00	C1-C11,C13-C16, C20-C24,C54-56	CAP CERAMIC .01 MFD. 50V + 80 -20%	23
17	5040-09421-00	C12,C15	CAP ELEC 100 MFD. 25V RAD + 50% -10%	1
18	5043-08996-00	C14,C17	CAP., CERAMIC, .1 MFD. 50V ± 20%	2
19	5043-09845-00	C25 - C53	CAP CERAMIC 1000 PFD. 50V AXIAL +/-20%	29
20	5700-09004-00		24 PIN SOCKET	11
21	5795-09611-00	2P1	40 PIN RIBBON CABLE ASS'Y 5"	1
22	5791-09038-00	2J2	6 PIN MALE CONN 09-65-1061	1
23	5791-09444-00	2J3	10 PIN MALE CONN 09-65-1101	1
24	5791-09027-00	2J4	9 PIN MALE CONN 09-65-1091	1
25	5310-08975-00	7A	4049 INVERTING HEX BUF	1
26	5551-09825-00	L7 THRU L20	COIL, 4.7 µH 30MA	14
27				
28	5551-09822-00	L3, L4	COIL, 4.7µH 3AMP	2
29	5551-09848-00	L1,L2,L5,L6	COIL, 2.0µH (RADIAL) .5A	4
30	5280-08973-00	4F	7408 QUAD 2 INPUT AND	1
31	5700-08985-00		40 PIN IC SOCKET	2
32	5281-09867-00	ØF	IC 74LS244 OCTAL BUS TRANSCEIVER	1
33	5019-09362-00	SR1, SR2, SR3	SIP 4.7K Ω 9 RES 10-PIN	3
34	5281-09308-00	3F	IC 74LS245 OCTAL BUS/LINE DR/LINE RCVR	1
35.	5340-09878-00	6D, 4D	RAM 2016 2K X 8	2

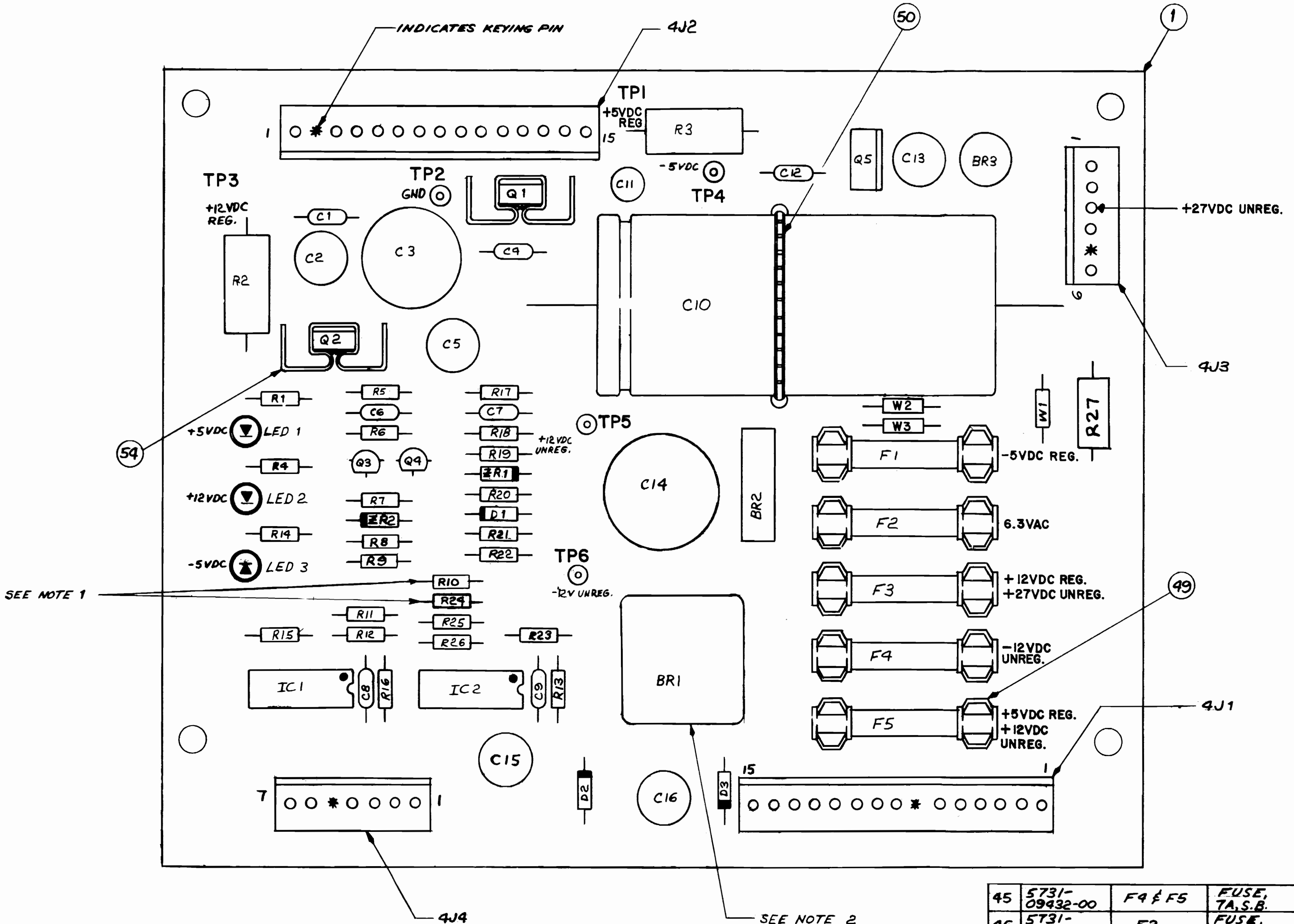
D-9179 BILL OF MATERIALS

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	NO. REQ'D
1	D-9176		ROM/PIA BD SUB-ASSEMBLY	1
2	SEE CHART	1A THRU 4C SEE CHART	GAME ROM	11
3	5010-09534-00	W1 THRU W4 SEE CHART	RESISTOR C.F. 0 OHM 1/4 WATT	SEE NOTE
4	A-5410-09911	1F, 2F	SPECIAL CHIP 2	2

ROM Board Assembly Drawing



ROM Board Logic Diagram

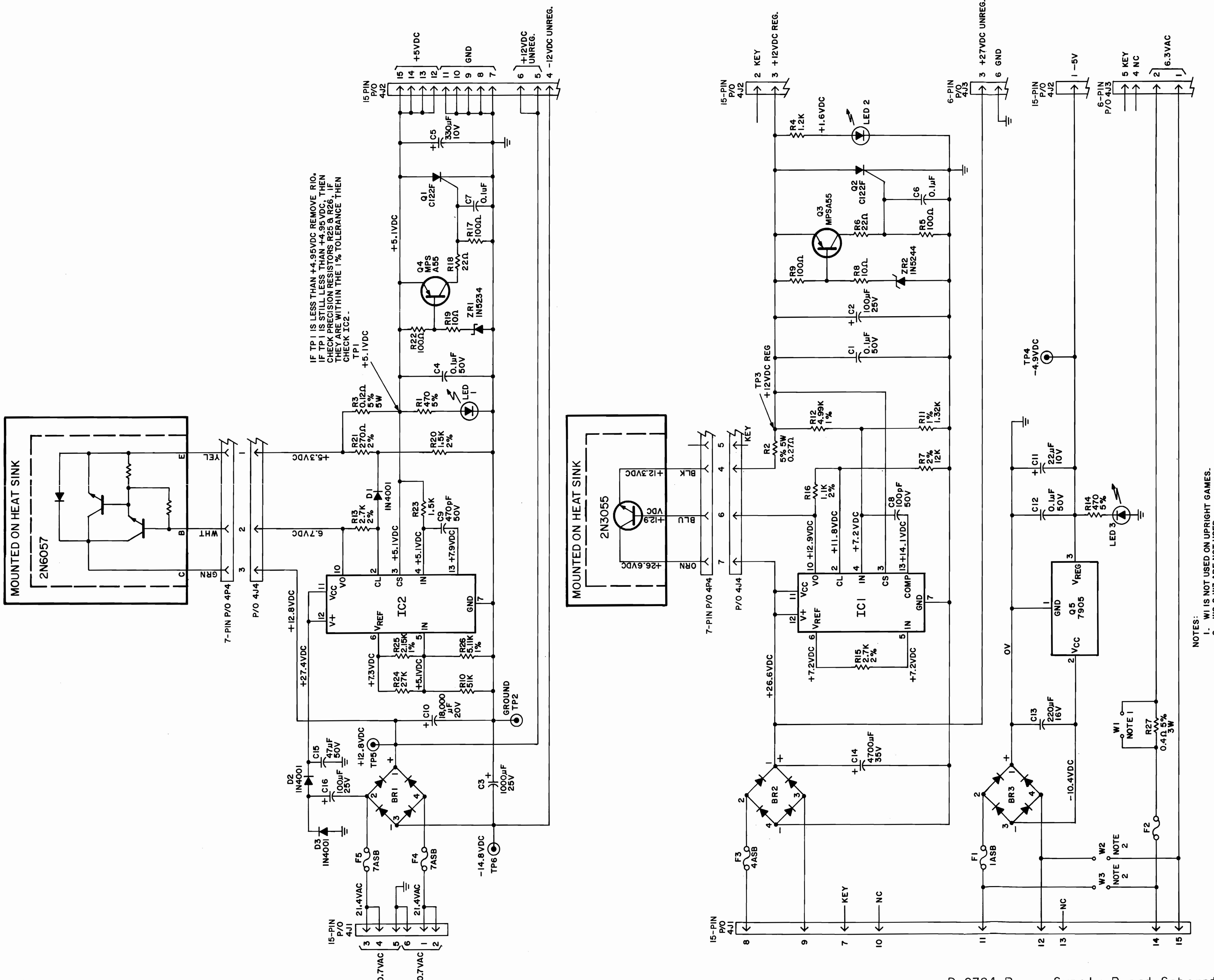


NOTES:
1. REMOVE R24 IF +5VDC IS GREATER THEM 5.25 VDC,
   REMOVE R10 IF +5VDC IS LESS THAN 4.75 VDC.
2. BR1 MUST BE MOUNTED 1/8" ABOVE SURFACE OF BOARD.
3. FOR SCHEMATIC REFER TO 16-8811.

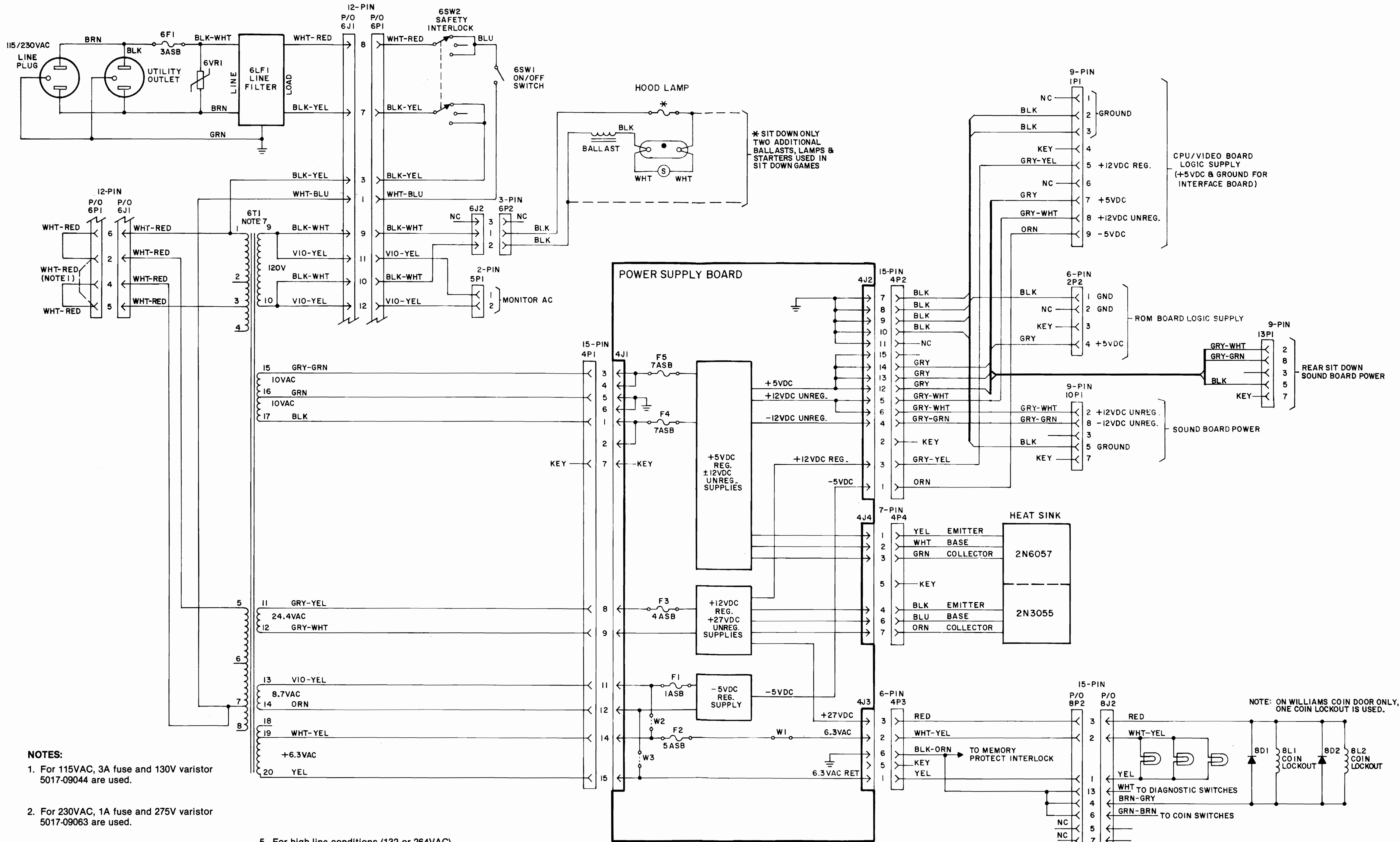
BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D NO.
1	5773-09679-00		BARE P.C. BOARD	1
2	5010-09085-00	R23	RESISTOR, 1.5K 5%, 1/4W	1
3	5010-09541-00	R13, R15	RESISTOR, 2.7K 2%, 1/4W	2
4	5010-09508-00	R21	RESISTOR, 270Ω 2%, 1/4W	1
5	5010-09428-00	R20	RESISTOR, 1.5K 2%, 1/4W	1
6	5010-09509-00	R16	RESISTOR, 1.1K 2%, 1/4W	1
7	5010-09510-00	R7	RESISTOR, 12K 2%, 1/4W	1
8	5010-09314-00	R4	RESISTOR, 1.2K 5%, 1/4W	1
9	5010-09416-00	R1, R14	RESISTOR, 470Ω 5%, 1/4W	2
10	5013-09542-00	R11	RESISTOR, 7.32K 1%, 1/4W	1
11	5013-09427-00	R12	RESISTOR, 4.99K 1%, 1/4W	1
12	5013-09426-00	R25	RESISTOR, 2.15K 1%, 1/4W	1
13	5012-09429-00	R3	RESISTOR, .12Ω 5%, 5W	1
14	5012-09512-00	R2	RESISTOR, .27Ω 5%, 5W	1
15	5012-09037-00	R27	RESISTOR, 0.4Ω 5%, 3W	1
16	5013-09665-00	R26	RESISTOR, 5.11K 1%, 1/4W	1
17	5010-09434-00	R6, R18	RESISTOR, C.F. 22Ω ±5% 1/4W	2
18	5010-09036-00	R5, R9, R17 & R22	RESISTOR, C.F. 100Ω ±5% 1/4W	4
19	5010-09039-00	R8, R19	RESISTOR, C.F. 10Ω ±5%, 1/4W	2
20	5010 09534-00	W1	RESISTOR, 0Ω	1
21	5043-08996-00	C6, C7	CAPACITOR, 0.1μF CERAMIC +80% -20% 50V	2
22	5040-09421-00	C2, C16	CAPACITOR, 100MFD, 25V RADIAL +50% -10%	2
23	5040-09422-00	C15	CAPACITOR, 47 MFD, 50V RADIAL +50% -10%	1
24	5040-09420-00	C3	CAPACITOR, 1000MFD. 25V RADIAL +75% -10%	1
25	5040-09419-00	C10	CAPACITOR, 18,000MFD 20V AXIAL +75% -10%	1
26	5040-09423-00	C5	CAPACITOR, 330MFD 10V RADIAL +50% -10%	1
27	5040-09504-00	C14	CAPACITOR 4700MFD 35V RADIAL +50% -10%	1
28	5043-09446-00	C1, C4 & C12	CAPACITOR .1MFD 50V AXIAL Z5U -20 +80%	3
29	5043-08065-00	C9	CAPACITOR 470PFD 50V AXIAL X7R ±10%	1
30	5043-09492-00	C8	CAPACITOR 100PFD 50V AXIAL S2L ±5%	1
31	5040-09506-00	C13	CAPACITOR 220MFD 16V RADIAL +50% -10%	1
32	5040-09493-00	C11	CAPACITOR 22MFD 10V RADIAL +50% -10%	1
33	5070-06258-00	D1, D2 & D3	DIODE, IN4001	3
34	5075-09406-00	ZR1	ZENER, IN5234 ±5% (6.2V)	1
35	5075-09662-00	ZR2	ZENER IN5244 ±5% (14V)	1
36	5190-09430-00	Q3, Q4	TRANSISTOR, MPS A55	2
37	5130-09661-00	Q1, Q2	SCR 8 AMP, 100V	2
38	5250-09515-00	Q5	VOLTAGE REGULATOR, 7905	1
39	5460-09424-00	IC1, IC2	VOLTAGE REGULATOR, 723	2
40	5100-09890-00	BR1	BRIDGE RECTIFIER, 35 AMP, 200V	1
41	5100-09513-00	BR2	BRIDGE RECTIFIER, 4.0A, 50V	1
42	5100-09514-00	BR3	BRIDGE RECTIFIER, 1.0A, 50V	1
43	5671-09019-00	LED1, LED2, LED3	LED, RED	3
44	5824-09298-00	TP1 — TP6	TERMINAL #1502-1 (TEST POINT)	4
45	5731-09432-00	F4 & F5	FUSE, 7A, S.B.	2
46	5731-06314-00	F3	FUSE, 4A, S.B., 250V	1
47	5731-06569-00	F1	FUSE, 1A, S.B. 250V	1
48	5731-09651-00	F2	FUSE, 5A, S.B. 250V	1
49	5732-09178-00		FUSEHOLDER,	10
50	03-7520		TIE WRAP	1
51	5791-09074-00	4J1 & 4J2	HEADER, 15 PIN 09-65-1151	2
52	5791-09039-00	4J3	HEADER, 6 PIN 09-65-1061	1
53	5791-09497-00	4J4	HEADER, 7 PIN 09-65-1071	1
54	5705-09663-00		HEAT SINK	2
	5705-09688-00		HEAT SINK	0
55	5010-09682-00	R10	RESISTOR C.F. 51K ±5% 1/4W	1
56	5010-09324-00	R24	RESISTOR, C.F. 27K, ±5% 1/4W	1

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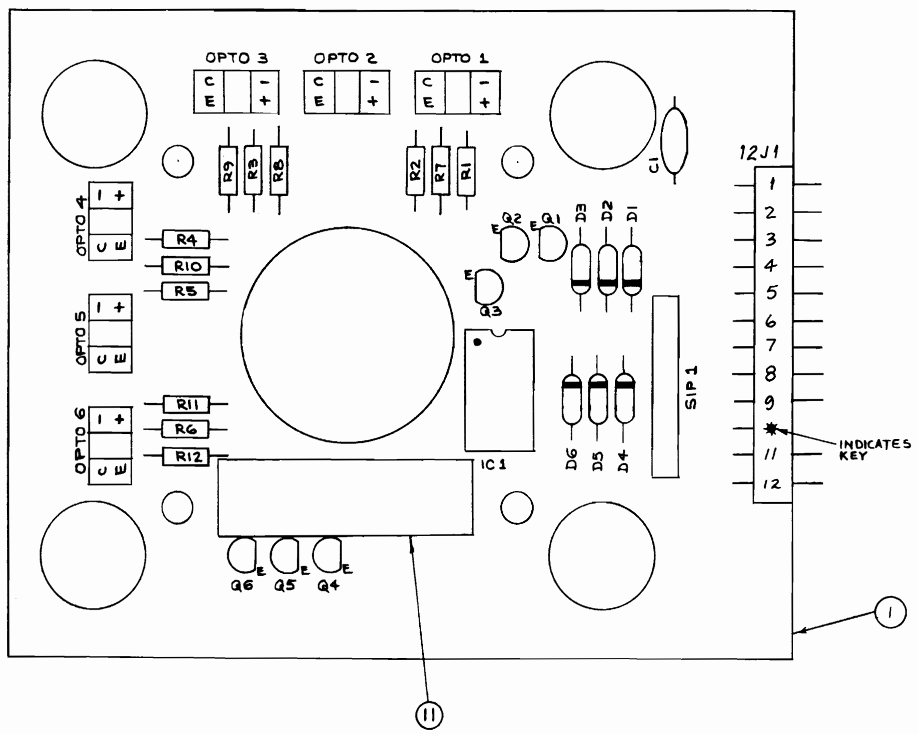


D-8784 Power Supply Board Schematic Diagram

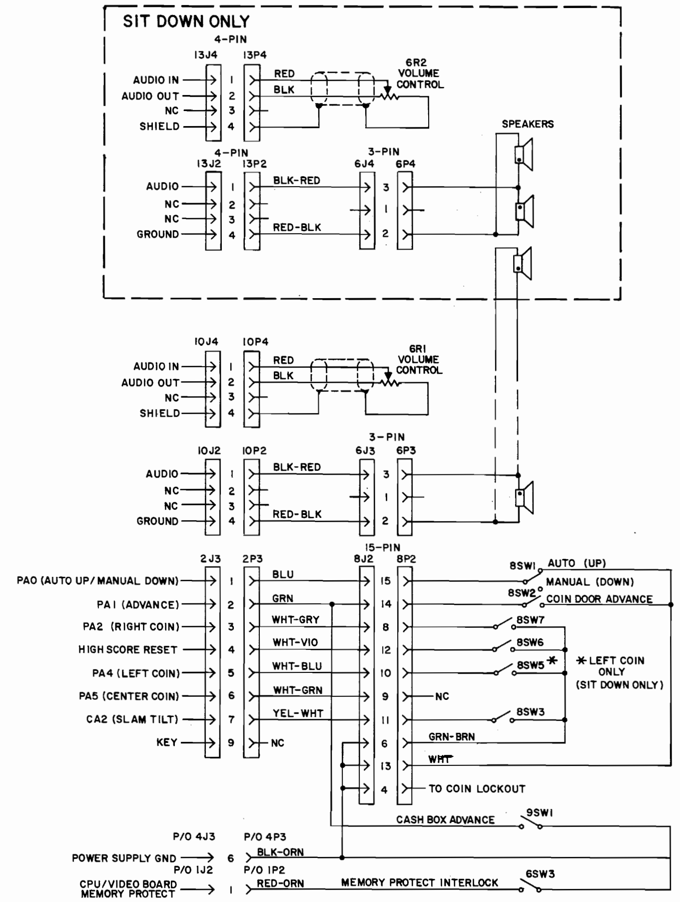


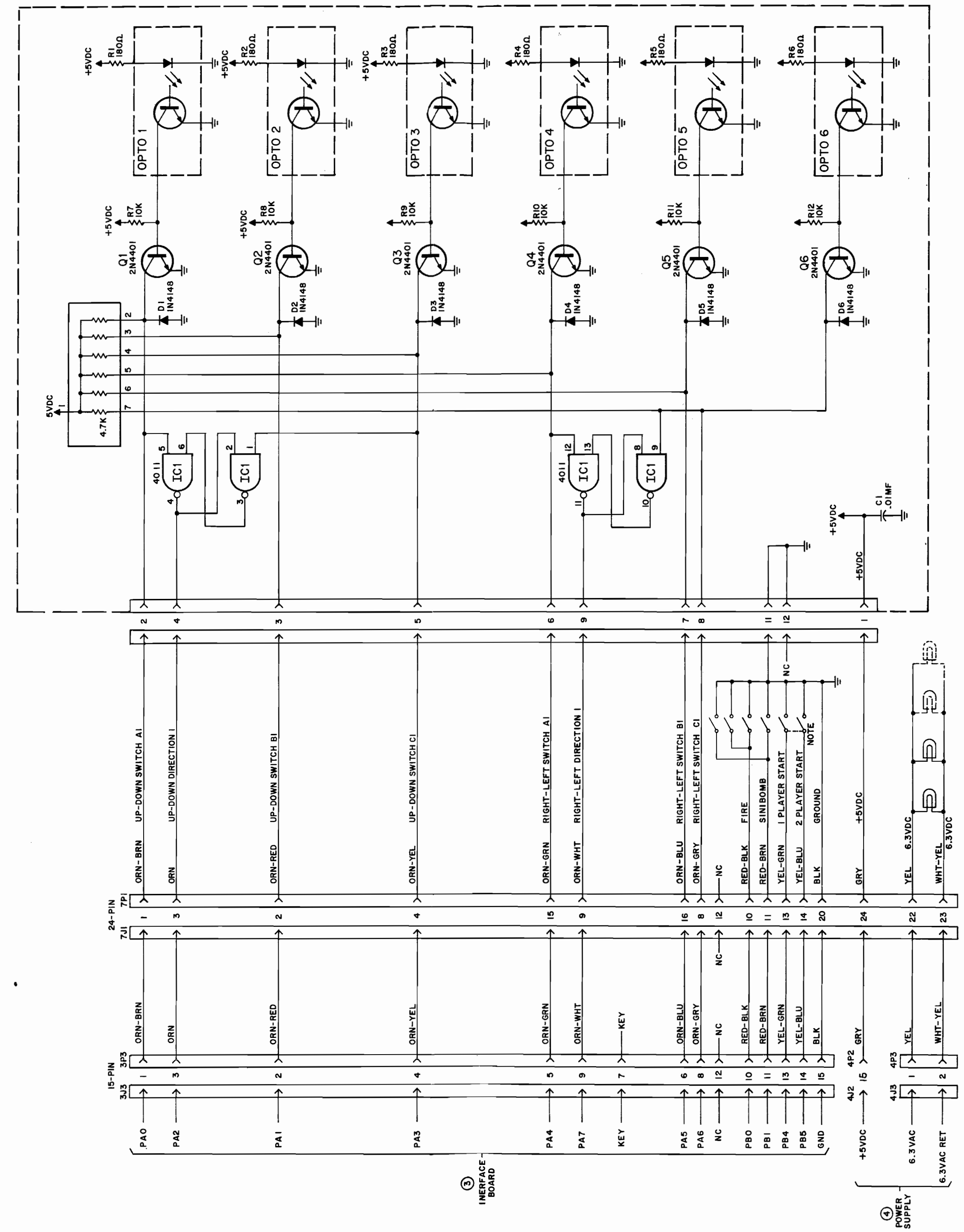
NOTES:

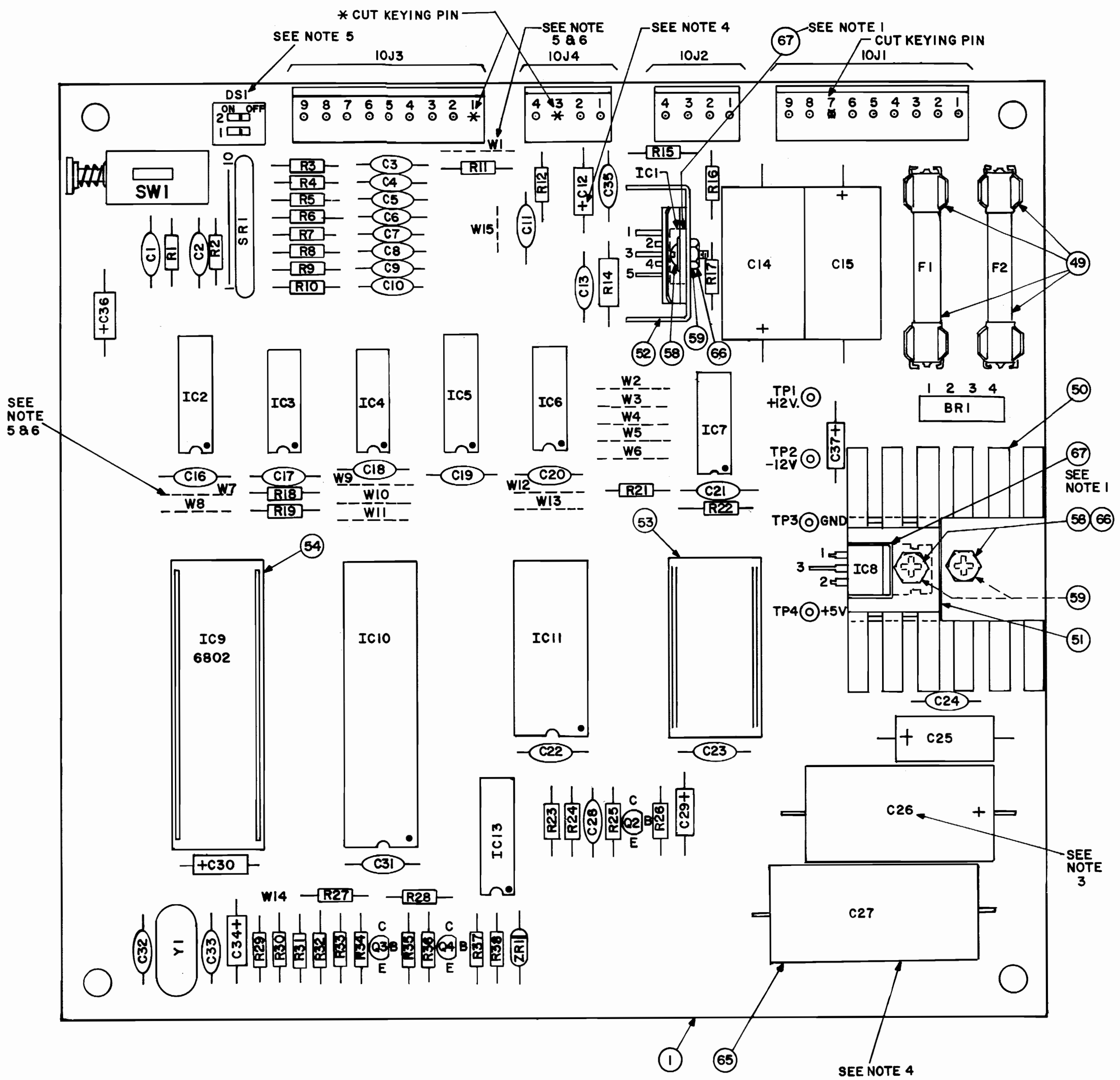
1. For 115VAC, 3A fuse and 130V varistor 5017-09044 are used.
2. For 230VAC, 1A fuse and 275V varistor 5017-09063 are used.
3. Jumper wires on 6P1 shown with solid lines are connected for 115VAC operation. Only the one shown with a dashed line is connected for 230VAC operation.
4. For low-line conditions (103.5 or 207VAC) move WHT-RED wire from 6T1-3 to 6T1-2 and move WHT-RED and WHT-BLU wires from 6T1-7 to 6T1-6.
5. For high-line conditions (132 or 264VAC) move WHT-RED wire from 6T1-3 to 6T1-4 and move WHT-RED and WHT-BLU wires from 6T1-7 to 6T1-8.
6. Secondary voltages shown (±3%) are with 115/230VAC input.
7. Transformer Part No. 55610-09658-00.



BILL OF MATERIAL				
ITEM NO.	PART NUMBER	PART DESIGNATION	DESCRIPTION	QTY. REQD
1	5772-10068-00		BARE P.C. BOARD	1
2	5490-09827-00	OPTO 1 THRU OPTO 6	OPTO INTER MODULE SWITCH	6
3	5310-09155-00	IC 1	I.C., 4011B CMOS QUAD 2-INP NAND GATE	1
4	5019-09362-00	SIP 1	10 PIN, 4.7K, SIP	1
5	5010-09768-00	R1 THRU R6	RESISTOR, 180Ω, 1/4 W	6
6	5160-08938-00	Q1 THRU Q6	TRANSISTOR, 2N4401 NPN	6
7	5070-08919-00	D1 THRU D6	DIODE, IN 4148	6
8	5791-10142-00	12J1	12 PH 2420 09-75-1121	1
9	5010-09034-00	R7 THRU R12	RESISTOR, 10KΩ, 1/4 W.	6
10	5043-08980-00	C1	CAP., AXIAL, CERAMIC, .01MFD. 50V +80-20%	1
11	16-8850-59		LABEL- PCB ASSY ID	1







SOUND BOARD JUMPERS

JUMPERS USED	TOM TYPE	FORMAT	GAMES USED IN
W2, W5, W7, W9, W10, W15	2K x 8 2516, 2716	Sound & Speech	Gorgar, Blackout, Firepower, Black Knight, Jungle Lord, Pharaoh.
W1, W2, W5, W7, W9, W10, W15	2K x 8 2516, 2716	Sound Only	Defender Video & Pin, Solar Fire, Barracora, Hyperball, Stargate, Cosmic Gunfight, Varkon, Time Fantasy.
W3, W4, W5, W7, W10, W15	4K x 8 2532	Sound & Speech	Sinistar (Upright & Cockpit Front)
W1, W3, W4, W5, W7, W10, W15	4K x 8 2532	Sound Only	Robotron, Joust Video & Pin, Bubbles, Sinistar (Cockpit Rear)
W1, W2, W4, W5, W7, W10, W15	2K x 8 2516, 2716	Sound Only	Warlock
W1, W3, W6, W7, W9 W11, W12, W15	512 x 8 7641	Sound Only	Big Strike

BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	01-2 01-146-6		BARE P.C. BOARD REV F	1
2	5370-09156-00	IC1	TDA 2002 V AUDIO AMPLIFIER	1
3	5280-09012-00	IC2	7442 BCD-DEC DECODER	1
4	5280-09073-00	IC3	7400 QUAD 2 INPUT NAND	1
5	5280-08973	IC4	7408 QUAD 2 INP. AND GATE	1
6	5310-09153-00	IC5	4050 BUFFER	1
7	5310-09154-00	IC6	4068 8 INPUT NAND GATE	1
8	5310-08971-00	IC7	4069 HEX INVERTER	1
9	5250-09157-00	IC8	7805 5 VOLT REG. W/TO 220 CASE	1
10	5430-08972-00	IC10	6821 P.I.A.	1
11	5340-09003-00	IC11	6810 RAM	1
12	5371-09152-00	IC13	1408 D/A CONVERTER	1
13	5160-08938-00	Q2, Q3, Q4	2N4401 NPN TRANSISTOR	3
14				
15	5075-09018-00	ZR1	IN5996A 6.8V ZENER DIODE	1
16				
17	5100-09357-00)	BR1	MDA 200/3N253	1
	5100-09158-00)		BRIDGE RECTIFIER	0
18	5520-09020-00	Y1	3.58 MHz CRYSTAL	1
19	5010-08991-00	R1,R18,R19,R21,R22, R27,R30,R31, R32	RESISTOR, FC, 4.7K OHM, 5% 1/4 WATT	9
20	5010-09036-00	R2 thru R10	RESISTOR, FC, 100 OHM, 5% 1/4W	9
21	5010-09358-00	R12,R15,R28,R36,R38	RESISTOR, FC, 1K OHM, 5% 1/4W	5
22	5010-09181-00	R14	RESISTOR, FC, 1 OHM, 10% 1/2 WATT	1
23	5010-09161-00	R16	RESISTOR, FC, 2.2 OHM, 5% 1/4 WATT	1
24	5010-09361-00	R17	RESISTOR, FC, 220 OHM, 5% 1/2 WATT	1
25				
26	5010-08983-00	R23, R24, R26	RESISTOR, FC, 3.3K OHM, 5% 1/4 WATT	3
27	5010-09179-00	R25	RESISTOR, FC, 3.3M OHM, 5% 1/4 WATT	1
28	5010-09035-00	R29	RESISTOR, FC, 47K OHM, 5% 1/4 WATT	1
29	5010-09034-00	R33, R35, R37	RESISTOR, FC, 10K OHM, 5% 1/4 WATT	3
30	5010-09039-00	R34	RESISTOR, FC, 10 OHM, 5% 1/4 WATT	1
31	5043-08980-00	C1, C16 thru C23, C31	CAPACITOR, CER. .01 MFD. 50V. +80%, -20%	10
32	5043-09065-00	C2 thru C10	CAPACITOR, CER. 470 PFD. 50V. +-20%	9
33	5043-09345-00	C11	CAPACITOR, CER. .001 MFD. +-20% 100V.	1
34	5040-09365-00	C12, C30, C36	CAPACITOR, ELECT. 1 MFD. 63V. -10 +50%	3
35	5043-08996-00	C13, C24, C35	CAPACITOR, CER. .1 MFD. 50V. +-20%	3
36	5040-09165-00	C14	CAPACITOR, ELECT. 1,000 MFD. 16V. +-20%	1
37	5040-09164-00	C15	CAPACITOR, ELECT. 470 MFD. 10V. +-20%	1
38	5040-08986-00	C25	CAPACITOR, ELECT. 100 MFD. 10V. +-20%	1
39	5040-08893-00	C26	CAPACITOR, ELECT. 1,000 MFD. 25V. +-20%	1
40	5040-09376-00	C27	CAPACITOR, ELECT. 4700 MFD. 16V. +-20%	1
41	5043-09180-00	C28	CAPACITOR, CER. 47 PFD. 1K V. +-20%	1
42	5040-09343-00)	C29	CAPACITOR, ELECT. 10 MFD. 20V	1
43	5043-09169-00	C32, C33	CAPACITOR, CER. DISC, 27 PFD. 1KV. +-10%	2
44	5041-09163-00	C34	CAPACITOR, TANTALUM 2.2 MFD. 15V. +-20%	1
45	5041-09031-00	C37	CAPACITOR, TANTALUM 1 MFD. 25V. +-20%	1
46	5641-09658-00)	SW1	MOMENTARY SWITCH SPDT	1
47	5645-09330-00	DS1	2 STD, DIP SWITCH	1
48	5731-06314-00	F1, F2	4 AMP SLOW BLOW FUSE	2
49	5732-09178-00		FUSEHOLDER	4
50	5705-09172-00		HEAT SINK THERMALLOY #6072B	1
51	5705-09173-00		HEAT SINK THERMALLOY #6071B	1
52	5705-09199-00		HEAT SINK THERMALLOY #6030	1
53	5700-09004-00		24 PIN SOCKET	1
54	5700-08985-00		40 PIN SOCKET	1
55	5791-09027-00	10J1, 10J3	9 PIN MALE CONNECTOR 09-65-1091	2
56	5791-09028-00	10J2, 10J4	4 PIN MALE CONNECTOR 09-65-1041	2
57				
58	4006-01003-06		6-32x3/8" P-PH-S	3
59	4406-01117-00		6-32 HEX NUT	3
60	5010-09534-00		0 OHM RESISTOR	A/R
61	5824-09248-00	TP1 THR TP4	TERMINAL #1502-1	4
62	5010-09363-00	R11	RESISTOR, FC, 5.6K OHM 5% 1/4 WATT	1
63				
64	5019-09362-00	SR1	RESISTOR, 4.7K OHM 10 PIN SIP	1
65	03-7520-1		TIE WRAP	1
66	4703-00007-00		#6 EXT. LOCKWASHER	3
67	20-9229		THERMAL COMPOUND	.01

NOTES:

1. USE THERMAL COMPOUND BETWEEN IC1 AND IC8, AND HEAT SINKS.
2. CAUTION: AVOID STATIC DISCHARGE DAMAGE TO MOS LOGIC.
3. SYMBOLS SHOWN ON COMPONENTS ARE FOR REFERENCE ONLY.

   DO NOT SCREEN OR STAMP.
4. OBSERVE INDEX MARK OF ALL INTEGRATED CIRCUITS;

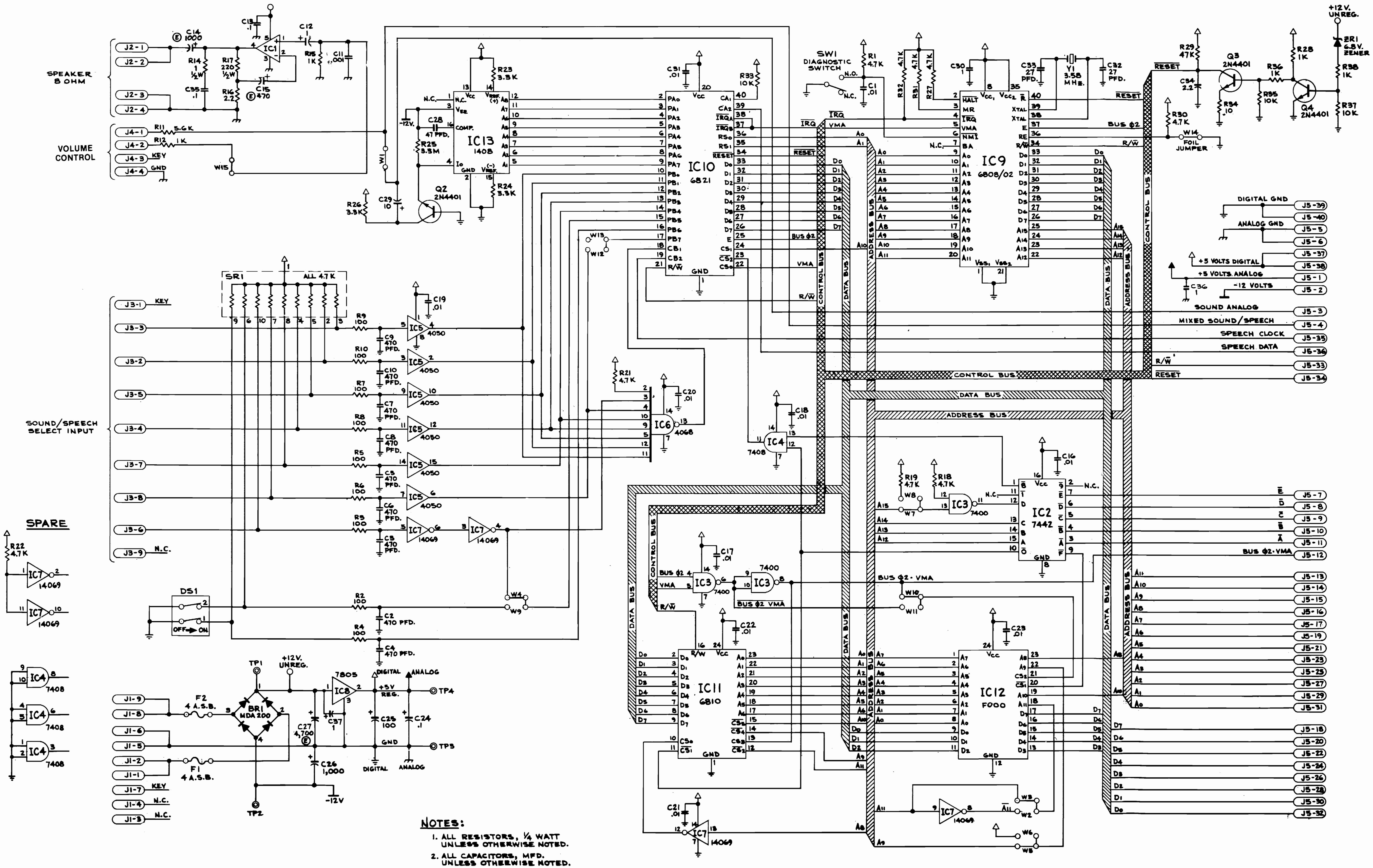
   DIODES D1, D2, AND ZR1;

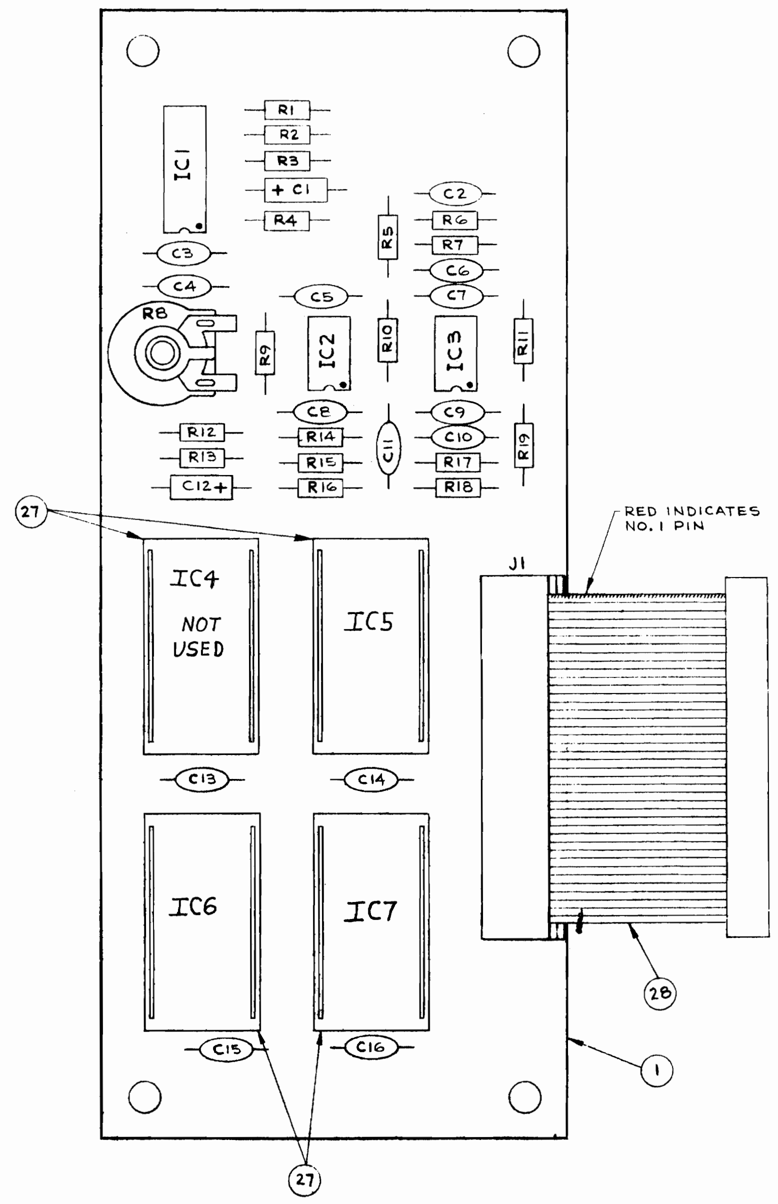
   CAPACITORS C12, C14, C15, C25, C26, C27;

   CONNECTORS 10J1, 10J2, 10J4, 10J3, 10J5;

   POSITION OF TRANSISTORS Q1, Q2, Q3, Q4.

D-8224 Sound Board Assembly Drawing


SPEAKER 8 OHM
VOLUME CONTROL
SOUND/SPEECH SELECT INPUT
SPARE
SW1 DIAGNOSTIC SWITCH
CONTROL BUS
DATA BUS
ADDRESS BUS
IC10 6821
IC9 6808/02
IC13 1408
IC11 6810
IC12 F000
IC2 7442
DIGITAL GND
ANALOG GND
+5 VOLTS DIGITAL
+5 VOLTS ANALOG
-12 VOLTS
SOUND ANALOG
MIXED SOUND/SPEECH
SPEECH CLOCK
SPEECH DATA
NOTES:
1. ALL RESISTORS, 1/4 WATT UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS, MFD. UNLESS OTHERWISE NOTED.

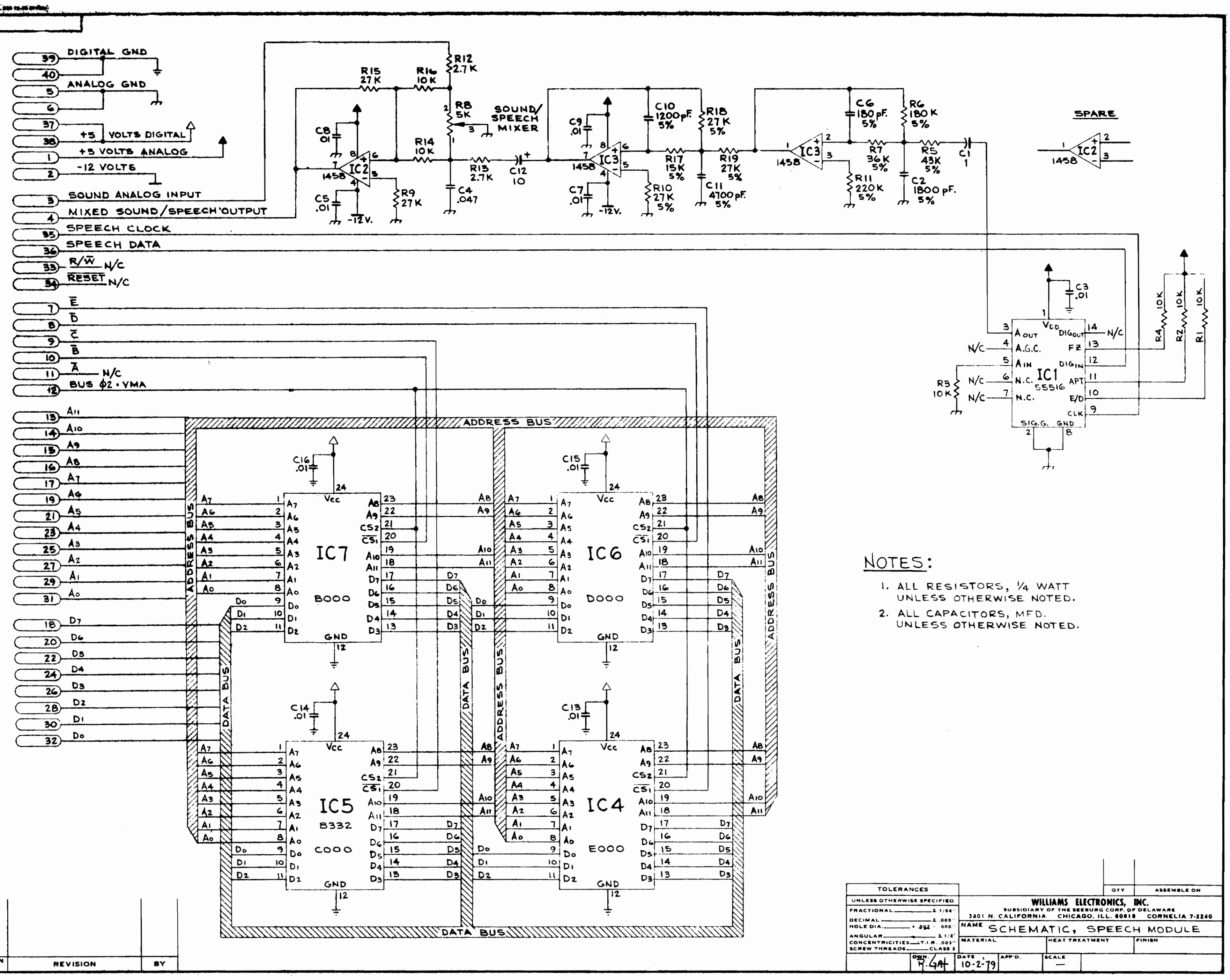


BILL OF MATERIAL

ITEM NO.	PART NO.	PART DESIGNATION	DESCRIPTION	REQ'D. NO.
1	1C-2001-1473		BARE P.C. BOARD	1
2	5A-9335	IC1	55516 CONTINUOUSLY VARIABLE SLOPE DELTA MODULATOR	1
3	5A-9321	IC2, IC3	1458 DUAL OP-AMP.	2
4				
5				
6				
7				
8				
9				
10	5A-8846	R11	RESISTOR, FC, 220 K OHM 5% 1/4 WATT	1
11	5B-8817	R1, R2, R3, R4, R14, R16	RESISTOR, FC, 10 K OHM 10% 1/4 WATT	6
12	5A-8624	R5	RESISTOR, FC, 43 K OHM 5% 1/4 WATT	1
13	5A-9333	R6	RESISTOR, FC, 180 K OHM 5% 1/4 WATT	1
14	5A-9342	R7	RESISTOR, FC, 36 K OHM 5% 1/4 WATT	1
15	5A-9185	R8	POTENTIOMETER, 5K OHM	1
16	5A-9324	R9, R10, R15, R18, R19	RESISTOR, FC, 27 K OHM 10% 1/4 WATT	6
17	5B-8997	R12, R13	RESISTOR, FC, 2.7 K OHM 10% 1/4 WATT	2
18	5A-8772	R17	RESISTOR, FC, 15 K OHM 5% 1/4 WATT	1
19	5A-9030	C4	CAPACITOR, .047 MFD. 20% 50 VOLT	1
20	5A-9350	C6	CAPACITOR, CERAMIC, 180 PFD. 5% 100 VOLT	1
21	5A-8980	C3, C5, C7, C8, C9, C13 THRU C16	CAPACITOR, CERAMIC, .01 MFD. +80%-20% 50 VOLT	9
22	5A-9031	C1	CAPACITOR, TANTALUM, 1 MFD. 20% 25 VOLT	1
23	5A-9347	C2	CAPACITOR, CERAMIC, 1800 PFD. 5% 50 VOLT	1
24	5A-9343	C12	CAPACITOR, ELECTROLYTIC, 10 MFD. 20% 20 VOLT LOW LEAK	1
25	5A-9348	C11	CAPACITOR, CERAMIC, 4700 PFD. 5% 50 VOLT	1
26	5A-9346	C10	CAPACITOR, CERAMIC, 1200 PFD. 5% 50 VOLT	1
27	5A-9004		24 PIN SOCKET	4
28	5A-9352	J1	RIBBON CABLE ASSEM.	1

WILLIAMS ELECTRONICS, INC.
SUBSIDIARY OF THE SEEBURG CORP. OF DELAWARE
3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240
NAME: SPEECH MODULE ASSEM.
DATE 9-28-79 SCALE 2:1 C-8228

REVISION: ITEM #2 PT. NO. WAS 5A-9351, ITEM #11 ADDED PT. NO., ITEM #14 ADDED PT. NO., ITEM #24 VOLTS WAS 20V. 10-4-79

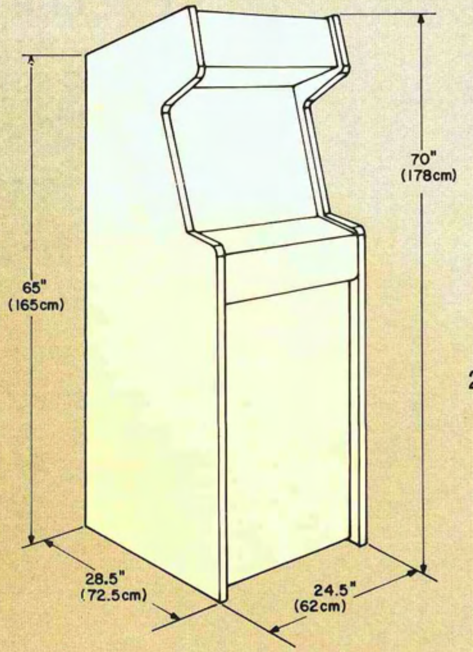


NOTES:

1. ALL RESISTORS, 1/4 WATT UNLESS OTHERWISE NOTED.
2. ALL CAPACITORS, MFD. UNLESS OTHERWISE NOTED.

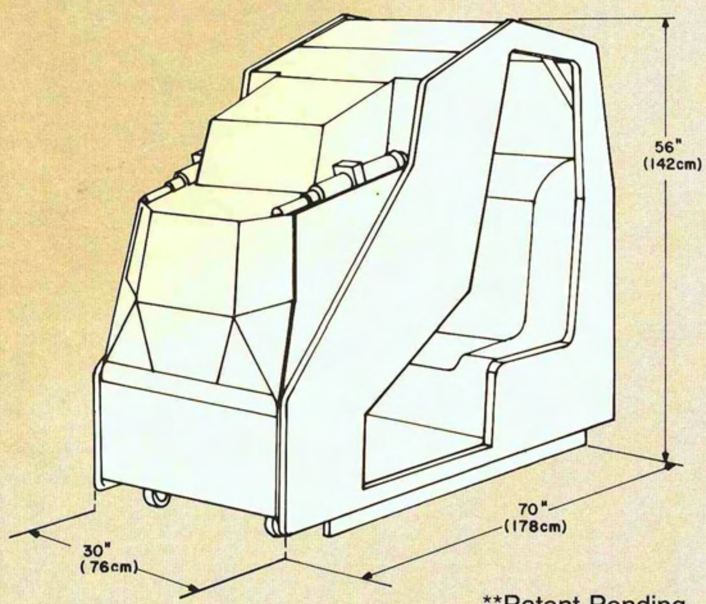
WILLIAMS ELECTRONICS, INC.
SUBSIDIARY OF THE SEEBURG CORP. OF DELAWARE
3401 N. CALIFORNIA CHICAGO, ILL. 60618 CORNELIA 7-2240
NAME: SCHEMATIC, SPEECH MODULE
DATE 10-2-79

C 8228 Speech Module Assembly and Logic Diagrams



UPRIGHT:
Weight
270 lbs. (122.5 kg.) uncrated
290 lbs. (131.5 kg.) crated

COCKPIT:
Weight
342 lbs. (155 kg.) uncrated
402 lbs. (182.5 kg.) crated



**Patent Pending
Specifications subject to change without notice.

POWER REQUIREMENTS
115/230VAC Nominal, 50/60Hz
@1.7/0.85A 192W
(20A surge for one cycle at power turn on)

Normal Line = 98-126VAC
196-252VAC

High Line* = 113-145VAC
226-290VAC

Low Line* = 88-113VAC
176-226VAC
*Transformer jumpers required.
See service manual.

ENVIRONMENT
Operating Temperature
0° to +45°C ambient
(+32° to +113°F)

Storage Temperature
−40° to +65° C ambient
(−40° to +149°F)
90% RH at 40°C (104°F), non-condensing

MONITOR
19″ Color Raster
non-interlaced
UL, CSA & DHHS Approved

VIDEO SYSTEM**
256 Colors, 340 x 240 PIXEL Resolution
6809E Microprocessor
ROM: 44K BYTES
Video and Scratch RAM: 50K BYTES
CMOS RAM: 1Kx4
Special RAM: 2K BYTES

SOUND SYSTEM
6808 Microprocessor
ROM: 24K BYTES (cockpit)
U.S. Patent No. 4272649

SPEECH SYSTEM**
Digital to Analog
CVSD System

JOYSTICK**
Optical Sensing
49 discrete directions and degrees of movement
(6 separate speeds in 8 directions plus center off position)

Warning—This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been certified to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to correct the interference.

SERVICE
For the back-up that keeps you out-front, call Williams toll-free at 800/621-1253.
In Illinois, call toll-free at 800/572-1324.

Williams® ELECTRONICS, INC.
3401 N. California Ave., Chicago, IL 60618
(312) 267-2240, Telex 253095